ARCHIVES OF OPHTHALMOLOGY.

GLAUCOMA IN GENERALIZED VASCULAR NÆVUS OF THE SKIN—REPORT OF CASE WITH ANGIOMATOUS CHANGES IN THE IRIS.[1]

BY DR. ARNOLD KNAPP, NEW YORK.

(With three illustrations, one in color, on Text-Plates VIII. and IX.)

CASE REPORT: P. H., aged 11, was first seen on October 11, 1926, stating that at school four years ago his sight was found defective and he was given glasses. He has a generalized vascular nævus of the skin of the face and body (photograph) and a drooping of the left eyelid. At the age of one and a half years he suffered from infantile paralysis which resulted in atrophy of the left leg; when five years old he had a stomach attack, with severe headache and left hemiplegia lasting for two weeks. There has been quite constant nasal obstruction and mouth-breathing at night. Occasional bright blood has been noticed in the bowel movements. There has been no hemoptysis. Rarely there is slight blood from the nose after blowing it, occasionally a mild epistaxis, but nothing severe. The gums sometimes bleed rather profusely after brushing, and small "blood blisters" between the incisor teeth seem to have increased of late.

Physical Examination (Dr. W. W. Herrick): Weight 62½ lbs., height 4′ 4″. There is marked nasal obstruction with much adenoid tissue of the nasopharynx. The left tonsil is quite large, but is superficially normal. The skin of the face and upper extremities and trunk shows a diffuse formation of nævi. These also appear on the gums and hard palate.

[1] Read before the Amer. Ophthal. Soc., Quebec, June, 1927.

These are not the local punctate capillary knots of hereditary telangiectasis but resemble the ordinary "birth marks." The cardio-vascular system seems normal, excepting the capillaries. The blood pressure is $^{110}/_{80}$. The boy is round-shouldered and the lungs are slightly emphysematous. The abdomen and its viscera are negative, as is the nervous system.

The laboratory examinations show a quite marked secondary anæmia; a platelet count which is low, but not near the dangerous line; a normal blood chemistry and normal urine. The coagulation time and bleeding times are normal. The fragility test shows that the resistance of the red cells to hemolysis is normal.

In Dr. Herrick's opinion the boy is an example of congenital diffuse nævi, which indicates some developmental defect in the capillaries of the skin and mucosa of the mouth. There is marked nasal obstruction from adenoids, and hypertrophy of the left tonsil. There is no evidence in this case of an intrinsic disorder of the blood. There is no great danger of serious bleeding, as in examples of hereditary telangiectasis.

Dr. J. W. Babcock removed the tonsils and adenoids under a general anæsthetic on November 1st. The tonsils on microscopic section showed numerous large germinal centers and abundant lymphoid tissue. The covering epithelium was normal. The crypts were practically normal in size. One contained a large epithelial plug and several contained masses of bacteria. Adenoids contained abundant lymphoid tissue with many large germinal centers. There was no evidence of tumor growth or tuberculosis.

Examination of the Eyes: R.-6.5 D.$=\frac{3}{100}$. L.-5.50 D.$=\frac{3}{100}$. In each eye: corneal diameter 13*mm;* conjunctiva did not show any dilated vessels, and the anterior chamber was deep. The cornea was clear. The iris was off-color, of a dull grayish-blue. There was superficial atrophy; a network of superficial branching white lines and some dilated vessels were visible. The most striking features were many grayish nodules, which were scattered over the iris without any zone of predilection. (See drawing.) With the slit lamp they were grayish, somewhat translucent, not related to the blood vessels and were superficial to the iris stroma. I was fortunate in having these findings confirmed by Basil Graves. The nodules

ILLUSTRATING DR. ARNOLD KNAPP'S ARTICLE, "GLAUCOMA IN GENERALIZED VASCULAR NÆVUS OF THE SKIN—REPORT OF CASE WITH ANGIOMATOUS CHANGES IN THE IRIS."

UNIV OF MIC

ILLUSTRATING DR. ARNOLD KNAPP'S ARTICLE, "GLAUCOMA IN GENERALIZED VASCULAR NÆVUS OF THE SKIN. REPORT OF CASE WITH ANGIOMATOUS CHANGES IN THE IRIS."

Neuro-fibroma.

Angiomatous Changes in Iris.

UNIV. OF MICH.

did not change after a tuberculin test nor over an observation period of eight months. Pupils 5*mm*. Odd: deep cup with atrophy. Field: concentric contraction to 30° R., 40° L. Tension: R. 50, L. 62 (Schiotz). With pilocarpin ½% 5 times daily the tension was reduced to R. 42, L. 46.

December 2nd, under a general anæsthetic, a 1½*mm* trephining was done at upper limbus in both eyes. On dissecting the conjunctiva downward an unusual plexus of episcleral vessels was exposed. Operation was without incident. The excised piece of iris was fixed in Zencker and prepared for microscopic examination. Healing after operation was uneventful and a distinct filtrating bleb developed.

A subcutaneous tuberculin test gave neither a general nor a local reaction. Pupils were dilated with atropin and a good view of fundus was possible. The eye-grounds showed no changes except some pigment-lack in the choroid, some pigment accumulation in the periphery but no vascular changes in the choroid or retina. On May 27th there is good filtration; with correction the vision was R. = $\frac{10}{100}$, L. = $\frac{10}{70}$ —. T.: R. 16, L. 18. Field unchanged.

The microscopic sections showed a thickening of the iris from a proliferation of endothelial cells with many new-formed vessels. This suggested an angiomatous condition, an opinion in which Dr. F. H. Verhoeff was kind enough to concur. The picture was similar to that found in the skin nævus. Toward the surface in some places the cells were crowded together and in layers, forming nodular protuberances. These iris changes have not been found in any of the cases reported in the literature. They offer a ready explanation of the glaucomatous process in that these iris changes in the periphery obstructed the filtration angle.

Recently Yamanaka in an article on "Nævus flammeus mit gleichseitigem Glaukom" (*Kl. M. A.*, p. 372, March, 1927) stated that the association of cutaneous nævus and glaucoma has now been observed in 14 cases. In only one case (Beltman, *Arch. f. Ophth.*, lix., p. 502) was the condition bilateral. In most of the cases reported the eye is affected on the side of the nævus changes and on which the eyelids are especially affected. The nævus formation generally extends on to the bulbar conjunctiva and episclera. In these the glaucomatous

process produced hydrophthalmos in 10 and glaucoma without eyeball enlargement in 4. Salus points out (*Kl. M. A.*, 1923, vol. lxxiii., p. 305), that the glaucoma in these cases is not necessarily always congenital, or present in earliest life, but that the glaucoma may not develop until after many years up to the 36th year. Elschnig and Nakamura were the first to regard nævus of the skin and glaucoma as having an etiological relation. In Nakamura's case (*K. M. A.*, 1922, vol. lxix., p. 313) the nævus and hydrophthalmos were accompanied by thickening of the bones on the same side (skull and thorax). The affected eye showed an iris poor in stroma and many radiating pink vessels on the surface. This association of nævus and unusual bone development the author regards as evidence of a disturbance of the peripheric nerves. Elschnig sees a parallel in exophthalmos pulsans where the dilation and increase of vessels with associated increased secretion is the cause for the glaucoma. He has furthermore shown that glaucoma only accompanies nævus flammeus and never angiomata of the eyelids or face. Nakamura says that it is not to be excluded that with the nævus and its vascular anomaly the same cause may be responsible for structural changes in the iris and iris angle as is usually found in hydrophthalmos. Safar (*Z. f. A.*, 1923, vol. li., p. 301) was able to examine microscopically an eye with hydrophthalmos occurring with nævus. The iris was dark brown, its surface rough and poor in crypts with no indication of an iris ruffle. The cause for the glaucoma Safar finds in a posteriorly displaced Schlemm's canal with incompletely developed scleral spur, with thickening of iris tissue at the angle and partial incomplete development of Schlemm's canal. These are all changes which have been observed in other cases of hydrophthalmos. The choroid did not present any vascular peculiarities whatever. Safar concludes that the glaucoma in his case of nævus resulted from an interference of the excretory channels, and the association was due not to a causal relation of one to the other but because both anomalies are co-ordinated and with other developmental errors depend on embryonal disturbances.

A number of authors report vascular changes in the fundus. Thus, Bar (*Z. f. A.*, 1925, p. 628), in his case, found the retinal veins very dark and tortuous, pigmented areas in the retina

and a ring of delicate veins about the macula. Elschnig's (*Z. f. A.*, 1918, p. 190) case had dilated vessels at the limbus like a vascular plexus. The fundus showed broadened vessels; iris was normal. Beltman (*l. c.*) found the choroidal vessels broad and thin-walled. Ginzburg (*K. M. A.*, 1926, p. 298) reported on a case of cutaneous nævus, glaucoma and coloboma in which an unusual choroidal vessel was found in the choroidal coloboma.

In my case where a satisfactory ophthalmoscopic examination was possible after operation no vascular changes were discernible in the fundus.

To recapitulate, this case is unusual as it is the first in which angiomatous changes were present in the iris. The only manifest changes in this iris picture were superficial atrophy, hypertrophy of radiating white lines and many grayish superficial nodules. The fundus showed no vascular anomaly. The angiomatous changes in the iris in their presumable extension to the iris periphery, by obstructing the excretory channels, offer a ready explanation for the glaucoma.

DISEASES OF THE EYE AND ADNEXA DUE TO FUNGI AND THE HIGHER BACTERIA.[1]

By Dr. S. R. GIFFORD, Omaha, Neb.

(From the Department of Ophthalmology, University of Nebraska Medical College, Omaha, Nebraska)

(With five illustrations on Text-Plate X.)

ONE of the fascinating things about the practice of Ophthalmology is the infinite variety of diseases which come into its domain. The ophthalmologist, like the dermatologist, no matter how great his experience, is always likely to come upon something which he has never seen before. And the reason for this is not far to seek, since the cornea, conjunctiva, and lacrimal sac, are, like the skin, the constant repositories of debris from the air, containing all sorts of bacterial life. While most of the pathogenic bacteria proper except the tubercle bacillus and the spore-bearers do not remain viable for more than a short time outside of the animal body, this is not true of the molds and higher bacteria, which are swarming all about us on vegetation and in the soil, and which find favorable conditions for growth when they are blown into the conjunctival sac, or when a slight abrasion gives them a foot-hold on the cornea. Thus it is that a review of the literature on any of these organisms will nearly always show, besides the large number of cases furnished by the dermatologists, a certain number of eye cases. A large number of these infections have occurred among farmers or those handling grain and hay, and this doubtless accounts for our having

[1] Read by invitation before the Ophthalmic Section, College of Physicians, Philadelphia, Dec. 15, 1927.

ILLUSTRATING DR. S. R. GIFFORD'S ARTICLE, "DISEASES OF THE EYE AND ADNEXA DUE TO FUNGI AND THE HIGHER BACTERIA."

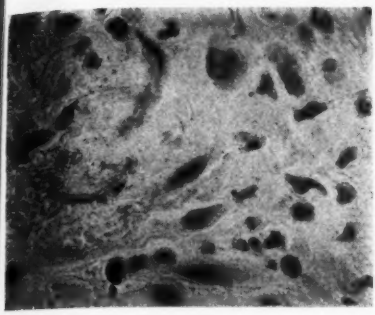


FIG. 1.

Section of conjunctival nodule in Parinaud's conjunctivitis showing radiating group of filamentous organisms.

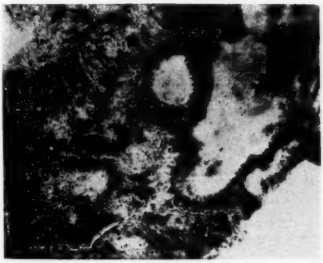


FIG. 2.

Section of concretion of the canaliculus showing radiating arrangement of actinomyces threads.

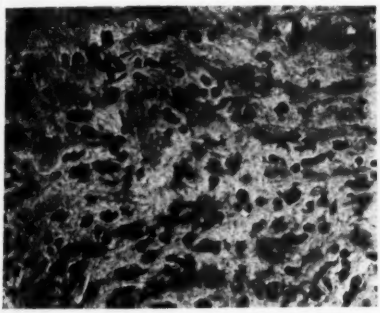


FIG. 3.

Sections of cornea in kerato-mycosis; (x) threads of aspergillus.

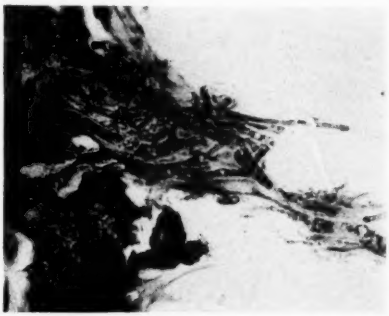


FIG. 4.

Smear of membrane removed from cornea in kerato mycosis.

FIG. 5.

Section of tissue removed from lid showing threads resembling aspergillus.

UNIV. OF MICH.

seen in Omaha what might seem like more than our fair share of these diseases.

At the risk of boring you, I must spend a few minutes in describing some of these organisms themselves, and their place in the botanical system. All of them belong to the hyphomycetes. Nearest to the true bacteria are the trichomycetes, forming slender threads, not over one micron thick, without septa, and without specialized fruiting bodies. The lowest division of the trichomycetes is the trichobacteria, including leptothrix, which shows no branching, and cladothrix, which shows false branching, the false branches splitting off the parent stem. The other division is the actinomyces, which shows true branching. While the term streptothrix is still used frequently for a group of thread-like organisms showing true branching, but not forming the club-like structures in the tissues characteristic of actinomyces, Lieske has apparently proved that there is no way of differentiating the two groups of organisms. The clubs are only the reaction of the organism to the tissues, and are never found in the organisms isolated from plants, while the animals which eat these plants develop typical actinomycosis. The cultural characteristics of the saprophytic forms, which are aerobic, change completely when they are isolated from animal lesions. Hence it seems that this whole group should be called actinomyces.

Next above the trichomycetes in the scale come the Fungi Imperfecti, whose pathogenic members are the yeasts and the Sporothrices. The yeasts multiply characteristically by budding, and in human blastomycosis only these large round or oval double-contoured bodies are found in the tissues while on culture media a net work of threads is also produced. Another yeast, Oidium albicans, which causes thrush in children, produces both threads and budding bodies on the mucous membranes. The Sporothrices grow as branching threads two microns thick, with lateral pear-shaped spores which form their principal mode of multiplication. Davis has shown that the distinction of two strains, Sporothrix Schenkii and Sporothrix Beurmanni, is not justifiable, since both can produce pigment, and form chlamydospores under certain conditions, and the complement fixation reactions with the two strains are identical. He believes that there are two varieties, Sporothrix Doir

and Councilmanni, which are distinct, and which have caused a few human infections, but that most of the cases reported are due to one organism, which should be called Sporothrix Schenkii after the prior observer.

The true molds are of more complicated structure than the organisms just described. Their threads are thicker, four to five microns or more, and they produce more or less complicated fruiting bodies. The phycomycetes, of which the typical member is Mucor, show no septa in the threads, while the mycomycetes, including the forms of Aspergillus, Penicillium, and Verticillium, have septate threads.

Time will permit only a brief mention of the eye lesions which have been caused by these various organisms. Notes on a number of these will be found in von Herrenschwand's *Pathogenische Microorganismen des Auges*, and a new book is promised by Cavara which will be devoted to fungous diseases of the eye. A new edition of Axenfeld's *Bacteriology* will bring the data to be found in his early edition up to date. (No attempt will be made to completely review the literature here.)

Leptothrix is familiar to us chiefly as Leptothrix buccalis, a fairly constant inhabitant of the normal mouth, and most laryngologists have seen cases with numerous plugs of leptothrix threads protruding from the tonsillar crypts. It has also been reported as causing pharyngitis, bronchitis, bronchopneumonia, and in a case of Cozzolino caused retro-pharyngeal abscess with fatal meningitis. In this case pure cultures demonstrated its pathogenicity, but pure cultures have been rarely obtained (only about six times). Ophthalmologists know of leptothrix from early descriptions of the so-called leptothrix concretions of the canaliculi, but, as will be seen later, only a few of these have been proved to be due to leptothrix. Attention has been called to this organism recently by Verhoeff's description of a delicate thread-like organism in sections of 17 out of 18 cases of Parinaud's conjunctivitis. It showed no branching, was considered a leptothrix, and hence the name Leptothricosis Conjunctivæ was proposed for this disease. Similar findings were made in Verhoeff's laboratory in cases reported by Lemoine and Dunphy. (Keiper's report of similar organisms in a case could not be confirmed by Verhoeff or other pathologists.) No cultures of the organism

were obtained in these cases, but Wherry and Ray grew a filamentous organism from a case supposed to be Parinaud's conjunctivitis. I examined four cases by Verhoeff's technique without finding organisms, but in two cases this year, thread-like organisms were found which seemed to be identical with those described by Verhoeff. On account of the difficulties of differentiating the delicate organisms by this special technique, it seems quite likely that they have been overlooked in our earlier cases and in those of other observers, and that a large number of these cases will be recognized as due to this filamentous organism. Whether this is a true leptothrix or not remains to be seen, as cultures are necessary to determine the presence or absence of true branching. As is coming to be known, three other diseases may be indistinguishable clinically from Parinaud's conjunctivitis, tuberculosis of the conjunctiva, conjunctivitis due to bacillus tularensis, and what Pascheff has called *conjunctivitis necrotisans infectiosa*, which is due to a distinct organism. Aside from one culture from a concretion to be mentioned, that of Wherry and Ray mentioned above, and the case to be described Leptothrix has not been grown in pure culture from the conjunctival sac. The only description of infection of the globe, so far as I know, is that of a panophthalmitis following cataract extraction reported by Sorokin. (White masses on the cornea proved to be clumps of unbranched threads whose growth could be followed in drops of blood on potato for several days.)

In a case of conjunctivitis seen in 1920, I found Leptothrix in smears of the secretion, and was able to grow it in pure culture on blood-serum. The case in no way resembled Parinaud's conjunctivitis, but was a chronic bilateral conjunctivitis, in a girl of twenty-two, which had been present for over a year. Some sticky secretion was present, the lower folds were thickened, and there was marked congestion of the bulbar conjunctiva, and of the lid borders, extending out along the Meibomian glands. The condition cleared up in five weeks under ordinary treatment. This organism, though growing fairly readily aerobically on ordinary media, proved to be extremely pathogenic for animals, two minims of a culture injected subconjunctivally producing death in twenty-four hours. In another case of chronic meibomitis, a strain of

leptothrix was grown from the Meibomian secretion, this one growing very sparingly, being non-pathogenic for animals, but producing, like the other strain, true spores. The threads in smears and cultures were one to one and one-fourth microns thick, at least twice as thick as the organisms found in sections of Parinaud's conjunctivitis, which more nearly resembled streptothrix or actinomyces in size. In another case of chronic Meibomitis a small mass of leptothrix threads was found. In a series of routine examinations of conjunctival smears, Snyder found leptothrix once. It is evident, therefore, that in spite of the very meager mention of it in the Ophthalmologic literature, it may be a not uncommon inhabitant of the conjunctival sac and especially of the Meibomian glands, living usually as a saprophyte, and only rarely attaining a mild degree of pathogenicity.

Actinomyces (Streptothrix) is of interest to ophthalmologists chiefly as the cause of so-called concretions of the canaliculi. Von Graefe in 1854 first examined these concretions microscopically, and found them to consist of masses of slender threads which he considered the threads of leptothrix. Fourteen subsequent observers accepted his opinion as to the organism found in their cases, but after Cohn described the branching of the threads in his case and insisted that this marked the organism as a different one, which he called Streptothrix Foersteri, most observers have confirmed the presence of true branching. Seventeen have called the organism found Streptothrix, and fourteen actinomyces, or streptothrix actinomyces. Only one observer, Cannas, obtained leptothrix in culture, and as other organisms were present, Axenfeld has doubted the value of his findings. Six observers have obtained an organism showing branching in cultures, and Axenfeld concludes that probably all concretions are due to the same organism, which he prefers to call Streptothrix, on account of the clinical differences of the cases from actinomycosis. However, as before stated, Lieske seems to have proved that the two organisms are indistinguishable bacteriologically, and since the name streptothrix had been previously used for one of the higher fungi, there is no reason for using either this name or Nocardia, which has been used by the French authors, for the organism which should properly be

called actinomyces. These concretions of the canaliculi have a clinical, as well as bacteriologic interest, as they are a cause of lacrimation which always persists until an ophthalmogist who has the condition in mind discovers the concretion, and by simply slitting the canaliculus and curetting out its contents, usually gives prompt and permanent relief. I have seen seven of these cases, in five of which material was studied, and have examined material from an eighth case. All the patients were adults, five living in cities and three in the country. All complained of lacrimation, and where the concretions were small, this was the only symptom. Where the condition was of longer standing, reddening of the conjunctiva at the inner angle was present, often with some conjunctival secretion, and watery pus could be expressed from the canaliculus. The larger concretions formed visible nodules at the site of the canaliculi, one case showing a swelling one-half by three-fourths by one-fourth inch in size over the upper canaliculus and one almost as large below. In this case lacrimation had been present for ten years and the swellings were noticed for five years. Another patient had been given various collyria without relief. Dacryocystitis was suspected but treatment for this was refused and it was not until thirteen years after the first symptoms that two small concretions were found and removed. In most cases symptoms had been present for one to four years. Most often only one canaliculus was affected, usually the lower, but in two cases concretions were present in both upper and in another case in the right upper and lower canaliculi. None had a true dacryocystitis, and in nearly all cases, fluid could be injected freely into the nose after removal of the concretion. In one case the concretions had caused pressure necrosis with a resulting opening onto the skin. In all the others, the wall of the canaliculus was intact, and in no case was there any evidence of invasion of the surrounding tissues. (The so-called concretions themselves contained only small amounts of lime salts, were of a cheesy consistency and made up of several smaller nodules. When these were crushed on a slide, they were seen to be made up chiefly of delicate threads showing true branching. Sections showed the radiating growth of the threads, not unlike that in actinomycotic nodules from lumpy jaw, the spaces between the

threads being filled by inflammatory cells, lime deposits and amorphous debris.) Cultures were successful in only two cases. In several, overgrowth by secondary organisms prevented successful culture, while in others the organisms were either dead or else suitable media could not be found. (The two strains secured in culture were obtained by dropping the nodules in half melted agar, and removing specimens at intervals of several days until the other aerobic organisms had died out.) Both cultures showed actinomyces of the type usually called streptothrix, being non-pathogenic and not forming clubs. One strain formed violet pigment on sugar-containing media, a property not described in any of the other strains obtained from concretions. Both strains grew aerobically.

The reason why these concretions develop in certain patients is not known. Gompert found a strain of actinomyces to be an occasional inhabitant of the normal conjunctiva, and it is easy to see that any temporary obstruction of the canaliculus might allow a mass of threads to grow in it, or such a mass may be blown into the eye with a foreign body and lodge in the canaliculus. The four cases described by Fuchs in which small yellow granules were curetted from depressions in the palpebral conjunctiva, these nodules proving to be masses of branched threads, would seem to represent a similar formation of concretions, possibly originating in the Meibomian glands. (Demicheri, Rosenhauch, Bakly and Sadik have reported similar granules to contain streptothrix.) I have looked for threads in the concretions of the tarsus often found in elderly persons, but have found nothing but lime salts.

In contradistinction to these instances of saprophytic growth in inconvenient localities, a few ophthalmological cases have been reported in which actinomyces has acted as a true infecting organism. Silberschmidt, Koch, and Tjumanzew have reported cases of dacryocystitis as due to it. An ulcer of the conjunctiva near the tearpoint was reported by Saint-Sevrin, and an abscess of the bulbar conjunctiva by Vincentini, both lesions containing actinomyces. Conjunctivitis due to this organism is described by several observers, and Synder states that the most severe case of ophthalmia neonatorum which he saw in a large series could be ascribed to

a streptothrix. The case described by Kastalsky seems to have resembled in some ways Parinaud's conjunctivitis. Corneal ulcers due to actinomyces are described, such as those seen in coal-miners by Löwenstein and in harvesters by Calderaro who also found the organism in the normal conjunctival sac of harvesters. Von Herrenschwand refers to several other cases. The lesions are rather characteristic, a white patch of membrane covering a depression, the membrane showing, as in David's case, a number of club formations as seen in actinomycosis elsewhere. An injury of the cornea is apparently necessary for their development. A much more serious infection, resembling true actinomycosis, was described by Partsch, in a patient whose orbit was invaded from a focus in the antrum. In a similar case reported this year by Pagani, the organism extended from a tooth to the antrum, and thence to the orbit, producing a large ulcer at the inner canthus. The patient died of meningitis. Woodruff reports a nodule under the eyebrow which had been present for six years. An encapsulated abscess was removed and branched threads were found in smears of the pus and in sections of the abscess wall.

Verhoeff has reported a case of infection following cataract operation in which both eyes became affected and were enucleated. Sections showed small abscesses containing granules made of branched threads resembling actinomyces. In another case of metastatic intra-ocular infection similar nodules were found in the sub-retinal fluid. The patient died of endocarditis and Verhoeff considered the infecting organism to be a leptothrix or actinomyces. No cultures were obtained.

Fuchs in 1920 reported an almost exactly similar finding in sections of an eye removed for recurring inflammation one year after cataract operation. (Small abscesses were found in the ciliary region between the sclera and choroid containing necrotic cells and granules made up of actinomyces threads and clubs. The sclera was perforated in one place by the granuloma. Fuchs mentions a case reported by Müller which was probably of similar nature, although here the origin of the organisms was apparently metastatic.[1])

The yeasts, while found occasionally on the normal con-

[1] I am indebted to Dr. Hektoen of the McCormick Institute for the use of some unpublished notes giving many of these references.

junctiva, have only rarely been proved to act upon it as an infectious agent. Oidium Albicans is a yeast-like organism which causes thrush, a membranous stomatitis in infants and this occasionally involves the conjunctiva. (Albruch believed a yeast to be the cause of an ulcer of the conjunctiva resembling tuberculosis.) Posey saw a polypoid conjunctival tumor in sections of which yeast bodies were found. Yeasts have been found in corneal ulcers occasionally, and even in a case of panophthalmitis after scleral puncture seen by Budek, but it seems possible that in most of these cases some other organism was the primary invader. In blastomycosis of the skin, however, the eyelids are affected very frequently, in about twenty-five per cent of cases, and McKee saw a corneal ulcer in one of these cases which contained yeast bodies.

Infections due to sporothrix have been of especial interest to me, since my father reported in 1910 the first case in which the ocular conjunctiva was involved, his being the first ophthalmological report of sporotrichosis outside of France. Sporotrichosis most commonly involves the hand following a superficial wound or abrasion. An ulcer resembling a primary specific lesion appears, followed by swelling of the lymphatic trunks and lymph nodes. In a good many cases, especially those described in the French literature, systemic involvement has occurred with deep gummata which often affect the long bones, and death may result. In America, the disease seems to be especially common in the Mississippi basin. Of fifty-eight American cases collected by Hamburger in 1912, fifty came from this district, twenty-two having originated in North Dakota and thirteen from Kansas. I know of nine later cases from Nebraska alone. In the ocular adnexa as elsewhere, the lesions are fairly characteristic, consisting of sub-cutaneous or sub-conjunctival nodules made up of smaller nodules, which may break down to form indurated ulcers. The lymphatics are nearly always involved. Of twenty-three ocular cases collected by Toulant, the lesion involved the skin of the lids in six, the conjunctiva in six, the lacrimal sac in one, the brow in one, the interior of the globe in six, and the orbit and lids in three. Four cases were fatal. In thirteen cases the ocular lesion was primary. The six intra-ocular infections were metastases by the blood stream in generalized sporo-

trichosis. To these ten later cases may be added, in six of which the conjunctiva or cornea were affected, in two the lids, in one the orbit and in one the lacrimal sac.

Besides my father's case involving the ocular conjunctiva, in which a pure culture was obtained, he saw five others which seemed clinically to be cases of sporotrichosis but in which cultures were not obtained. In four of these the lids were involved, in the other the conjunctiva and lacrimal sac. The other American reports are those of Wilder and McCullough, describing a laboratory conjunctival infection of one of the authors, Dwyer and Larkin, whose case developed lid lesions in the course of generalized sporotrichosis, and Bedell who saw a chronic conjunctival involvement with a large mass on the inner side of the lid. Bedell gives the literature to 1914. I have seen three cases of which two were proven by culture and the third so closely resembled H. Gifford's first case that we considered it probably of similar nature and the lesion cleared up promptly on potassium iodide. The two cases with cultures were a dacryocystitis with ulceration over the sac and involvement of the lacrimal and ethmoid bones, and an ulcer of the lid near the inner canthus. These cases have been described in the ARCHIVES OF OPHTHALMOLOGY, 1922 and 1923, so I will not go into detail about them here. I hope my slides will show their characteristic features as from the number of reports in several districts which have followed some one report calling attention to the disease, it seems certain that a number are being overlooked. It is especially gratifying to make a correct diagnosis of this disease, since once it is made, the use of potassium iodide in large doses, one dram three times a day for an adult, nearly always brings about prompt recovery. In one of my cases, the ulcer of the lid, healing did not occur until this was supplemented by the local application of Lugol's solution and seven per cent potassium iodide ointment. Cultures are necessary for a diagnosis since very few organisms ar found in smears. Glucose agar or Sabouraud's medium should be inoculated with a liberal amount of pus or tissue, and one or more tubes should be left at room temperature for six to eight days before pronouncing the culture negative, since the organism grows very slowly.

Of the true molds, the one which has proven of real pathogenic importance in a number of eye cases is Aspergillus, and especially Aspergillus fumigatus. This mold, when inoculated on the cornea by some superficial injury, especially with a stick or cornstalk, grows freely on the avascular tissue, forming a circular grayish plaque, often of a characteristic dry appearance, slightly raised above the surface, with a distinctly demarcated border. This consists of a mass of myclelial threads mixed with necrotic cornea and fibrin. The fruiting bodies have been rarely seen in the cornea as in the cases of Zade and Schirmer. (In Schirmer's case which came to section, the mass of threads was surrounded by an area of necrosis, outside of which was a ring of leucocytes.) Pain and congestion are often marked, and hypopyon is usually present. If the gray plaque, really a sequestrum of cornea, is removed early, apparently the whole fungus colony is removed with it, as healing usually occurs, but if the deeper layers of the cornea are involved, the whole cornea may be lost, and in a few cases the interior of the eye has become involved, as in Schirmer's case. While Aspergillus fumigatus has been the organism usually reported in keratomycosis, Cavara found a species of *Mucor* in a case and Morax found *Verticillium graphii* (the lesions in both these cases being superficial and running a benign course. Aspergillus flavus was found by Bietti in a mild case, but this and other species were found to be only slightly pathogenic for the rabbit's cornea by Mori and others, while Aspergillus fumigatus showed marked pathogenicity). Cases of keratomycosis have been only rarely reported, as Heilbrun in 1911 found only twenty cases in the literature, but are evidently more common, especially among farmers, than this would indicate, as Ball states that a country practitioner near St. Louis saw seven cases, and that he saw an eighth from the same district. This case of Ball's and one reported in Philadelphia by Churchman, are the only ones I have found described in America, though an American, A. H. Johnson, reported one from the Axenfeld clinic. Five cases have been reported from the Axenfeld clinic, another instance of the fact that where one of these supposedly rare conditions has been recognized, others are apt to be seen and rightly diagnosed. I have seen only one case and Dr. Harold Gifford had not seen

any before this. A Nebraska farmer, whose eye had become inflamed after an attack of influenza a month before, came in for treatment. There was a loss of epithelium over the outer half of the cornea, in the center of which was a typical grayish plaque as described above. Hypopyon was present and the eye was very painful. On attempting to remove the plaque with forceps, a grayish membrane came away extending in the center entirely through the cornea, allowing the aqueous to escape. In the next two days, in spite of local treatment, the infiltration spread through the entire cornea, so that the eye had to be eviscerated. Crushed fragments of the central membrane showed it to be a mass of coarse septate threads, six to eight microns in diameter. No fruiting bodies were found but in a culture on agar left at room temperature a pure culture of Aspergillus fumigatus was obtained. Sections showed large septate threads in the corneal stroma. No fruiting bodies were seen and there was no growth to be seen on the surface, the superficial growth having apparently been removed. (The whole cornea was infiltrated with cells, chiefly polymorphonuclears.) The cornea alone was available for section, but the contents of the eye, when removed, showed no frank pus and it can not be stated if they were involved in the infection.

Besides its incidence on the cornea, aspergillus may be carried into the eye by foreign bodies, and a few cases of infection of the vitreous, choroid, and retina have been reported as occurring in this way. (Koellner saw an infection of the sclera after a wood injury. Lowenstein saw a case of dacryocystitis due to aspergillus fumigatus.) It has also rarely affected the interior of the eye when transmitted there by the blood stream, as in the case of metastatic endophthalmitis described by Stock in a patient with a pulmonary aspergillus infection.

During the past month, Wright has reported from India two remarkable cases of infection of the orbit with an aspergillus thought to be aspergillus flavus. In one the whole orbit was involved in a large protruding granuloma, which had invaded the accessory nasal sinuses and had been diagnosed sarcoma. In the second case the origin was apparently from the naso-pharynx, the granuloma having extended through

the nasal bone to the inner angle of the lids. The threads were found in sections, chiefly within giant cells, and grew in cultures from the tissue. The X-ray seemed to benefit the lesions but the cases could not be followed to a cure. Terlinck reports one case of mycosis of the lids, aspergillus fumigatus being found in sections.

I have seen one case which may have been similar to this. A woman with ectropion of long standing developed a marked thickening of the everted lid, a reddish granulation tissue being raised three to four millimeters above the level of the skin, and covered with crusts. Part of this was excised and sections showed inflammatory tissue permeated with large septate threads. No fruiting bodies were seen, and culture could not be made after the threads were discovered, so it was impossible to identify the fungus, but from the size of the threads it could well have been an aspergillus. The ectropion was fairly well corrected by the removal of tissue, and the granulation tissue has not returned.

Of the higher molds which cause skin diseases such as favus and ringworm, it is sufficient to say that organisms resembling both Achorion Schonleinii and Trichophyton tonsurans have occasionally been found on the cilia in blepharitis and on the skin of the lids, usually in patients showing skin lesions elsewhere. A systematic search for fungi in those severe cases of blepharitis where most of the lashes are lost might show that infection by these organisms is not so rare as we now believe it to be.

While some of these conditions due to fungi and higher bacteria may be considered as merely rare curiosities, some of them, particularly concretions of the canaliculi, sporotrichosis and keratomycosis are, when they occur, of serious importance to the patient. They probably occur more often than the literature would indicate. They show usually certain definite signs which should distinguish them from other types of infection at once to the ophthalmologist who has these conditions in mind. The simple microscopic examination of smears or crushed tissue will usually reveal the organism, except in the case of sporotrichosis, where cultures are necessary, and the information so obtained is well worth the little time spent in such examinations.

BIBLIOGRAPHY.

Exact references to authors quoted will be found in the following:

AXENFELD-MCNAB. *Bacteriology of the Eye*, New York, 1907.

VON HERRENSCHWAND. *Pathogenische Mikroorganismen des Auges.* Berlin, 1927.

GIFFORD, H. *Oph. Record*, 1910, xix., p. 580.

GIFFORD, S. R. *J. Inf. Dis.*, 1920, xxvii., p. 296., *A. J. O.*, 1921, iv., p. 1, *Arch. of Oph.*, 1922, lxi., p. 540 and 1923; lxii., p. 264.

SNYDER. *Ophthalmic Rec.*, 1914, xxiii., p. 353.

HUNTEMULLER. *Kolle & Wassermann Hdbch.*, 1927, v., p. 1.

LIESKE. *Ibid.*, p. 17.

PLANT AND GRUTZ. *Ibid.*, p. 171.

FUCHS. *A. J. O.*, 1920, ci., p. 24.

VERHOEFF. *Arch. of Oph.*, 1924, liii., p. 517. *Arch. of Oph.*, 1926, lv. p. 225.

WRIGHT. *B. J. O.*, 1927, xi., p. 545.

A CASE OF CHLOROMA WITH OCULAR LESIONS.[1]

By Dr. MARTIN COHEN, New York.

(With ten illustrations, five in color, on Text-Plates XI.–XIII.)

BEFORE reporting this case, I desire to mention a few salient facts in respect to leukemia and chloroma, in order to better appreciate their relationship to the associated ocular lesions.

The involvement of the orbital and lid structures with chloroma is a rare affection. Dorsey Brannan, in the Johns Hopkins Bulletin of 1926, reports one hundred and twenty-nine cases of chloroma up to the year 1925. Since then, six cases have been reported.

Chloroma has a predilection for invading the skull and frequently selects the upper lids and orbit, where it causes bilateral lid swelling and exophthalmos. These signs, associated with anemia and the blood picture of myelogenous leukemia, suggest an early diagnosis of chloroma.

The above facts, including the recent advancement made in hematological research in regard to leukemia have prompted me to present this subject with a case report.

Chloroma, or better designated, chloro-leukemia, is considered by most hematologists as a form of myelogenous leukemia and not a disease of lymphatic origin. The cause of leukemia is unknown; nevertheless, it is considered to be a disease of the blood-forming structures, namely, the bone marrow and the lymphatics and not of the circulating blood per se, the blood in leukemia being simply a carrier of an increased number of lymphocytes or of pathological leucocytes

[1] Read before the Section on Ophthalmology, N. Y. Academy of Medicine, December 19, 1927.

ILLUSTRATING DR. MARTIN COHEN'S ARTICLE,
"REPORT OF A CASE OF CHLOROMA WITH OCULAR LESIONS"

FIG. 1. Age 12 mos. No evidence of orbital lesion.

FIG. 2. Age 2 yrs. 7 mos. Bilateral exophthalmos.

FIG. 3. Typical "Facies Chloromatosa," age 2 yrs. 8 mos. Bilateral lid tumor. Left eye: corneal ulcer with chemosis of ocular conjunctiva. Facial paralysis and swelling of parotid.

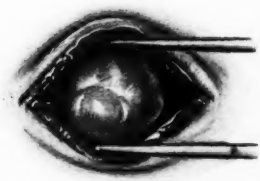


FIG. 4. Retrobulbar "chloroma" nodule in situ.

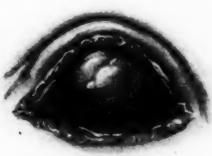


FIG. 5. Lid "chloroma" nodule in situ.

UNIV. OF MICH.

which are produced by an unknown infectious toxin, stimulating the blood-forming structures.

Leukemia is divided into two main types, the myelogenous and the lymphatic types; the myelogenous is principally derived from the bone marrow; and the lymphatic type originates from lymph structures.

The diagnosis of myelogenous leukemia depends on the recognition of the well-known physical signs, including frequently an enlarged spleen. The diagnosis, however, depends mainly on the examination of blood-stained preparations, which show many myeloblasts, myelocytes, and their derivatives. These embryonal cellular elements are considered pathological in the blood.

Lymphatic leukemia is diagnosticated by the usual physical signs, including enlarged lymph nodes, but also mainly by an examination of blood stained films showing an increased number of lymphocytes. It is difficult or impossible at times to differentiate morphologically between lymphocytes and myelocytes. Under such conditions, it is essential to make use of the recent blood and tissue staining tests, namely, the supra-vital stain and the oxidase and peroxidase reactions for differentiation. The latter have been used in this case.

The oxidase or peroxidase reaction is a ferment reaction. It stains the granular cytoplasm of myelocytes bluish, giving a positive oxidase reaction, while the non-granular cytoplasm of lymphocytes does not take on the bluish granular stain, giving a negative oxidase reaction. This differentiation is of purely scientific value.

The ocular lesions in the acute and chronic stage of myelogenous and lymphatic leukemia are frequently seen in the fundus. From a study of reported cases and my clinical observations, I believe that, ophthalmoscopically, the two types of leukemia cannot be differentiated from each other, as similar fundus lesions are present or absent in both types. Some reports indicate definite fundus changes for each type of leukemia. The fundus changes encountered in leukemia are small or large hemorrhages—either few or numerous—pre-retinal or inter-retinal. The smaller, sharply defined hemorrhages frequently show the central glistening whitish dots, seen in other diseases which involve the blood state.

These hemorrhages are probably due to an endothelial vascular disease which permits cellular elements to migrate and proliferate into lymphoid and other tissues.

The retinal veins appear dilated; the arteries are generally normal in calibre. The vessels have been described as having a whitish hue, owing to their containing an increased number of leucocytes. The appearance of œdema affecting the retina and disc, causing papillitis or choked disc, is frequently observed. As the choroid is extremely vascular and crowded with leucocytes, the fundus will have an orange or yellowish color. This appearance is possible only when the retinal pigment layer is thin. The yellowish color of the fundus, if accompanied with retinal inflammatory changes is diagnosed as leukemic retinitis, which condition is rarely seen. As the choroid is markedly involved, the term leukæmic chorioretinitis might be more applicable. Papillitis is a toxic and terminal manifestation.

In leukemia the vision is rarely affected unless the fovea is invaded, therefore in leukemia excluding chloroma fundus lesions, are mainly seen at first by the internist in medical wards where the patients receive routine ophthalmoscopic examinations, chloroma, however, is frequently seen at first by the ophthalmologist.

If in leukemia the upper lids or orbits are infiltrated with nodules, it is usually the myolocytic infiltration or chloroma which is responsible for the condition. Lymphocytic infiltrations or lymphomas rarely involve the lid and orbit.

The diagnosis of chloroma depends on the presence of the growth and its effect on the surrounding tissue and upon the blood picture of the accompanying myelogenous leukemia. The term chloroma signifies "green growth." The color is essential for establishing the diagnosis, although white chloromas have been reported. The green color of the growth is only present on exposure of the mass immediately after its removal, for the green color fades after a few minutes. This green color is probably due to a hematogenous pigment. The bilirubin derived from the hematin after the removal of iron may be oxidized to biliverdin. That such an oxidation reaction may take place in these growths is very probable since the myelocytes show an active oxidase or peroxidase

ILLUSTRATING DR. MARTIN COHEN'S ARTICLE,
"REPORT OF A CASE OF CHLOROMA WITH OCULAR LESIONS"

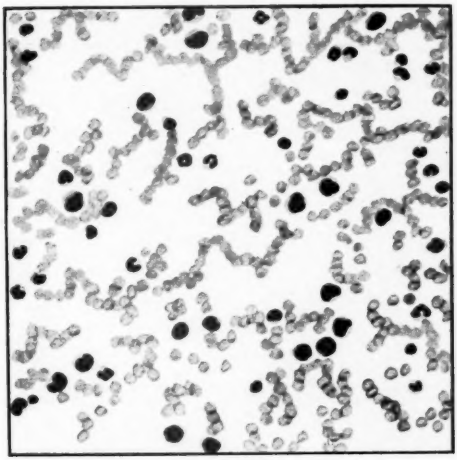


FIG. 6. Blood smear. Numerous leucocytes. The large mononuclear cells are myeloblasts.

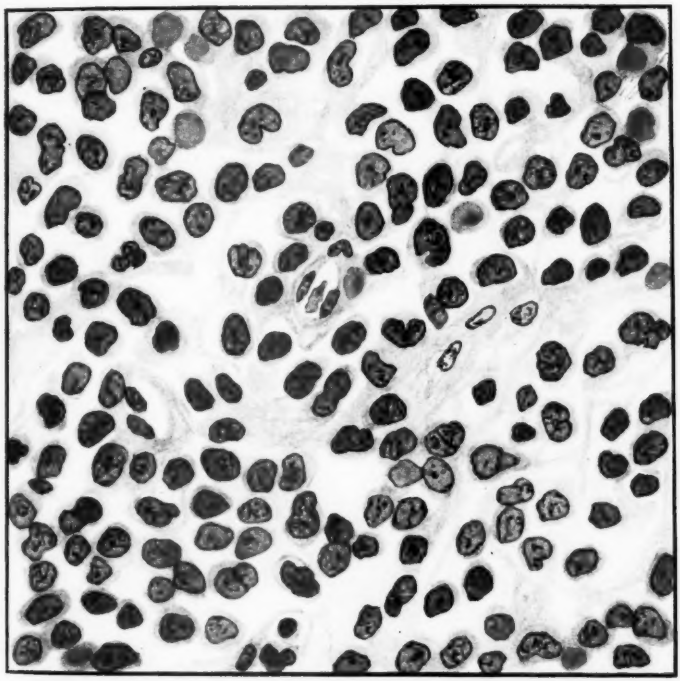


FIG. 10. High power of retrobulbar tumor nodule. Note the densely packed myeloblasts.

UNIV. OF MICH.

reaction. Moreover, the iron derived from the hematin would have an effect upon this oxidation reaction. Bilirubin is very readily oxidized. Chloroma has a malignant tendency. It usually occurs in children and young individuals. In a few cases trauma has been reported as an associated factor. Another child with lymphatic leukemia, recently under my observation, as well as the case presented, has had a tonsil and adenoid operation,—one of them ten days and the other eight days before the onset of symptoms of leukemia. It would be unscientific to claim any relationship between cause and effect from these two cases. I simply state these facts for the sole purpose of record. A week ago Doctor Curtin had under his care a patient with chloroma without any history of trauma. I have had the opportunity of examining this patient.

The objective symptoms of chloroma are frequently referred to the eye. In this case the features were characteristic and give the impression, as others have expressed, of a "Facies chloromatosa," illustrated in Figure 3. The histopathology of chloroma will be considered later in this report. The treatment consists in radium, X-rays, transfusion, and installation of castor oil drops to avoid corneal involvement, all of which are really of little value. The prognosis is grave. Chloroma is usually fatal within a few weeks or months after the diagnosis is made, giving a gloomy outlook for this fortunately rare disease in which all we are able to do at present is to strive to make an early diagnosis and treat it symptomatically.

Following is the Case Report:—

The patient, a boy, four and one-half years of age, was admitted to the New York Post-Graduate Medical School and Hospital on February 22, 1927. The chief complaint was bulging of both eyes for one month.

Family History.—The parents are Jewish, young, and have always been in excellent health. The patient is the only child.

The past history is essentially negative save for tonsillectomy and adenoidectomy. January 15, 1927.

Present Illness.—Following the operation, the child became anemic and very restless, eight days following the operation. Ten days later the upper lids became swollen and protrusion of both eyes was noticed. This condition progressed steadily. The neurological examination was

normal. The general physical examination was otherwise normal. As the child showed a marked pallor, a complete blood examination with other laboratory tests was requested.

The spinal Wassermann test was normal. X-ray examination of the head showed no evidence of brain tumor. Blood chemistry and urine normal. The spinal fluid was under normal pressure with normal analysis. Blood count—Reds, 3,980,000, Hemoglobin, 77 per cent, Leucocytes—Differential count: Polynuclears 32 per cent, Basophiles 1 per cent, Eosinophiles 2 per cent, Mononuclear Leucocytes 20 per cent, Small Lymphocytes 15 per cent, Large Lymphocytes 28 per cent. As the blood examination at first was not characteristic, repeated examinations were made. It is interesting to note here that although the chloroma was present the blood picture was not characteristic, suggesting an early manifestation of leukemia.

Eye examination.—Inspection of both eyes showed moderate non-inflammatory œdema of both upper lids associated with a marked exophthalmos. Both eyes protruded straight forward without any deviation or limitation of motion. Palpation of the eye-balls gave a doughy resistance. There was a normal condition of the conjunctiva, media, pupils, fundi and vision.

While under observation at the hospital for twelve days, the child received X-ray treatment and the condition slightly improved. He was discharged and the parents were advised to return with him for future examination. The eye condition became aggravated, however, and the child was readmitted on March 19, 1927. Five days prior to readmission the patient had severe pain in the right ear, increased prominence of both eyes, and a left facial paralysis. Physical examination on admission disclosed, beside the local eye condition, the following symptoms:—1. Dyspnœa and anorexia; 2. Cervical lymphadenopathy with slight neck rigidity; 3. Purulent discharge from right middle ear.

The patient became restless and very uncomfortable. The temperature was of a septic type ranging from 100° to 104°. Laboratory tests were as follows:—Blood examination: Leucocytes 3,600, Polynuclears 60 per cent, Lymphocytes 19 per cent, Transitionals 3 per cent, Mononuclears 4 per cent, Myelocytes 7 per cent, Myebloblasts 4 per cent. The finding of the latter pathological leucocytes with the peroxidase reaction (Fig. 7) established the diagnosis—Acute Myelogonous Leukemia. The urine contained many red blood cells and gave a negative Bence Jones protein reaction.

Other tests.—Spinal fluid analysis and pressure were normal. X-ray pictures of skull showed increased intra-

ILLUSTRATING DR. MARTIN COHEN'S ARTICLE,
"REPORT OF A CASE OF CHLOROMA WITH OCULAR LESIONS"

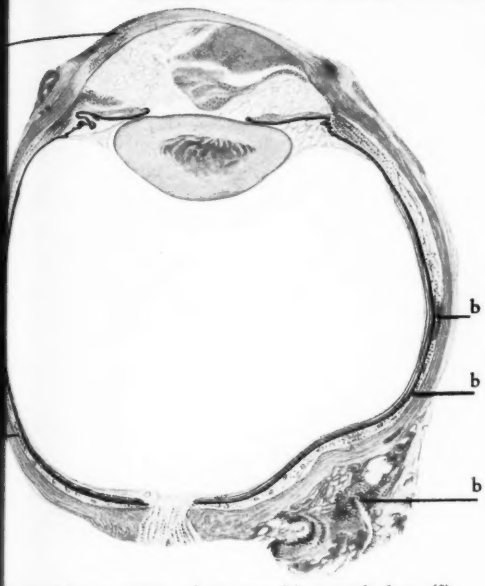


FIG. 8. Vertical section of the eye: (*a*) corneal ulcer; (*b*) infections of myelocytes.

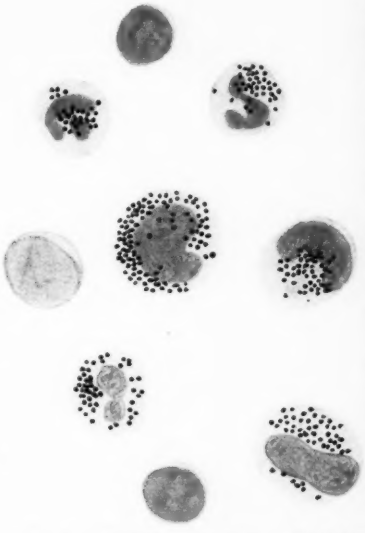


FIG. 7. Peroxidase reaction. The blue granules identify the mononuclear cells as myeloblast derivatives.

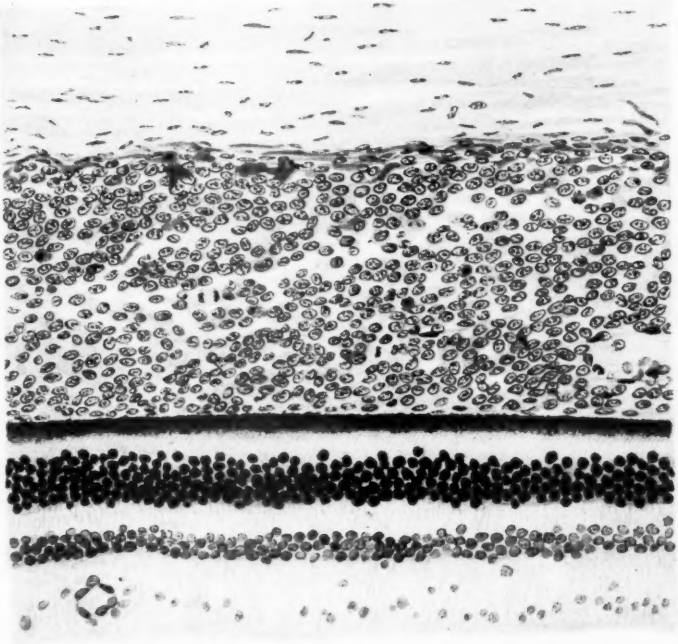


FIG. 9. High power of "chloroma" nodule in choroid. Note the two myeloblasts in mitotic division.

UNIV. OF MICH.

cranial pressure, especially in the region of the anterior fossa. X-ray of long bones showed no abnormalities. Conjunctival smears showed pus cells and staphylococci. Microscopical examination of tonsils and adenoids before admission to the hospital showed solely chronic inflammation.

The eye examination on readmission was as follows:—

The proptosis and lid swelling became more prominent, especially in the left eye. This eye showed an inflammatory reaction in the upper lid. There was also felt, below its supra-orbital ridge, "paraosteal," and beneath the skin, a movable, firm, flat infiltrated mass which later by microscopical study proved to be a myelocytic infiltrating nodule or chloroma. This nodule was non-adherent to the over-lying skin or to the periosteum, and practically included the entire upper lid.

Another myelocytic nodule also infiltrated the retro-orbital region and the glands in the parotid area, affecting the following nerves, the optic, facial, and the ophthalmic division of the trigeminus, causing papillitis, exophthalmos, lagophthalmos and corneal infiltration with anæsthesia. The involved left eye gradually became very painful, tender, with swelling of the upper lid; the conjunctiva became chemotic and the cornea infiltrated; this was followed with hypopyon and ulceration. These symptoms became aggravated, necessitating on the fourth day after re-admission surgical intervention. The patient was given a general anæsthetic; an incision was made below the supra-orbital ridge (Fig. 4), exposing a greenish colored mass which was dissected out. The wound was closed with sutures. The eye was then enucleated, exposing in the orbit a greenish yellow mass, a section of which was removed. The wound was left open for drainage and local treatment. The eye and removed tissues were placed in fixing solutions for future microscopic examination and report.

The second day following operation, the orbit became the seat of a purulent inflammation consisting of a greenish colored pus having fetid odor. The orbit was constantly irrigated with magnesium sulphate solutions without much effect. About the same time the right wrist became inflamed, this being due to another myelocytic infiltration of the tissues and not to a metastasis.

Four days following the enucleation of the left eye, the right cornea showed signs of infiltration, followed by ulceration. Fundus of right eye showed papillitis. The patient's general condition now became worse and finally after sixteen days in the hospital he succumbed to the disease. No autopsy was permitted.

Following is a pathological report of the eye and tissues removed: "They were stained with eosin and hematoxylin. No oxidase reaction was performed on these tissues; still, the cellular elements seen in these structures resemble the myeloblasts and myelocytes identified in the oxidase blood smears.

Eye (Fig. 8).—The cornea shows a central epithelial defect. The parenchymal fibers were separated and held polynuclears, occasional eosinophiles, and wandering cells. The endothelium is partly desquamated and swollen. No myelocytes were recognized.

The anterior chamber is filled with a purulent exudate predominating polynuclears. The peripheral angle is occluded with a purulent exudate.

Schlemm's canal is open.

The iris shows marked infiltration with polynuclears and large mononuclears having pale nuclei with scant chromatin content, also with a homogeneous narrow margin of cytoplasm.

A fair amount of mitotic division-figures are observed within the larger cells resembling myelocytes.

The ciliary body shows similar infiltration as iris.

Lens without change. Vitreous negative.

The retina shows no changes except the capillaries which contain a great nunber of cellular elements, as previously observed in iris and ciliary body.

The choroid (Fig. 9) is markedly distended, due partly to œdema, partly to marked distension of its numerous blood vessels, which are crowded with a large number of polynuclears and myelocytic elements; another cause for the thickening of the choroid is a diffuse and nodular infiltration with enormous numbers of large mononuclear cells, which have the characteristic morphology of the cellular elements identified in the circulating blood as myelocytes. Some of these nodules are composed of sheaths of densely packed cells with very little stroma; a great number of mitotic figures in various stages of division are noted among these cells. A few eosinophiles and small round cells are interspersed in this nodular mass.

Sclera is not involved.

Papilla shows moderate œdema.

The intervaginal space is distended and filled with a cellular exudate similar to that seen in the choroid.

The retrobulbar areolar space shows the cellular exudate as previously described.

Microscopic diagnosis.—Neuro-chorioretinitis with a purulent keratitis. Sections through nodules (Fig. 10) from the upper lid and retro-orbital mass reveal an œde-

matous areolar matrix densely infiltrated with a large number of myelocytes, occasional small round cells and a few erythrocytes; mitotic division-figures are noted frequently. These nodules resemble the infiltrates seen in the choroid. A large number of thin-walled capillaries with narrow lumen are seen in the nodules.

Tissue diagnosis.—Chloroma or myelocytic infiltrating nodules involving the left upper lid and the retro-orbital structures.

RADIATION THERAPY OF CANCERS OF THE ORBITO-PALPEBRAL REGION AT THE RADIUM INSTITUTE OF THE UNIVERSITY OF PARIS.

By Dr. GEORGE T. PACK, Birmingham, Ala.

(The Seale Harris Clinic, Birmingham, Alabama, and Department of Pathology, the School of Medicine, the University of Alabama, Tuscaloosa.)

At the time of the initial visit of the patient with a cancer of the orbito-palpebral region, an immediate biopsy, even though tiny, is performed. This is an absolute prerequisite for treatment inasmuch as the authorities believe that even when the diagnosis of cancer is evident, histologic study will reveal information concerning the variety and the radium sensitivity of the tumor in question, which will be invaluable for post-radiation statistical analyses.

If the tumor has been treated by radium or X-radiation elsewhere, the patient ordinarily is not eligible for admission to the Clinic. This is not a hard-hearted policy because the Curie Foundation is not for immediate charity, but for the purpose of bettering the existing methods of cancer treatment and to establish a rational scientific basis for radium therapy. This necessitates the primary treatment of the cancer, otherwise the variable radiation dosage used in other institutions, the lack of the original histologic data and the factor of acquired radio-resistance, unite to confuse the radium therapist. In the radium treatment of malignancies, if at first one doesn't succeed, one cannot try, try again with any certainty of success.

If the radiation dosage is great but insufficient, or incorrectly timed, or incorrectly spaced, then within six weeks to two months the tumor may develop a radioresistance which per-

sists indefinitely. The statistics of the Radium Institute indicate that the efficiency of the radiation treatments diminishes rapidly with their number. An improper first treatment may render a neoplasm incurable by radiations. The Röntgen ray is never successful after radium has failed: on the contrary, recurrences after X-radiation are occasionally susceptible to radium treatment. When association of the two modes of radiation is purposely planned, it is advisable to have the Röntgen therapy always precede the treatment by radium.

Classification of Carcinomas of the Orbito-Palpebral Region.

According to their anatomical location, these cancers are divided into four groups: (a) Lesions limited to the eyelids; (b) Lesions originating in the eyelids but finally extending into the periorbital region; (c) Lesions developing in the skin of the orbital region but not invading the eyelids; (d) Cancers having invaded the orbit of the eye. Epitheliomas of the commissures, particularly of the internal commissural region, merit special attention and are of considerable gravity because of their tendency to propagate precociously along the internal and external walls of the orbit. When and where an epithelial cancer of the conjunctiva originates, it is always preceded by a substitution of squamous epithelium of the cutaneous type for its own characteristic epithelium.

According to the histological make-up the cancers of this area are divided into three groups: (a) The epidermoid epitheliomas. These consist of slender or thick cellular strands, usually anastamotic, sometimes confluent, and generally but not always bordered at their periphery by cells resembling the stratum germinativum. In the center of these strands, cell differentiation has proceeded towards keratinization either of the cutaneous or the mucous membrane type. The keratinized squamous cells are often agglomerated in concentric pearl formations, isolated or entombed within intra-epithelial cavities. These tumors ulcerate quickly, rapidly invade the subcutaneous tissues and metastasize frequently to lymph nodes at the mandibular angle and in the parotid area. (b) The group of non-epidermoid epitheliomas comprise a separate species, characterized negatively by the absence of histo-

logic evidences of cellular evolution towards keratinization. In the great majority of instances the cells are evidently of the same morphological type as the tumor commonly known as the baso-cellular epithelioma. The tumors may likewise appear ulcerated, but they either do not infiltrate the subcutaneous tissue or else do so tardily. Their evolution is very slow and the regional lymph glands are free of metastatic deposits. (c) The group of intermediate epitheliomas comprise divers varieties. For the most part they are composed of massive lobules, formed of undifferentiated cells, of the basal type, but one sees here and there little isolated groups of cells in a state of epidermoid differentiation.

The Mode of Treatment.

When the eyeball is normal and in place, the treatment is directed towards the definite and complete sterilization of the neoplasm, without serious injury to the eye.

When the eye has been enucleated and the orbit invaded, the condition is usually a recurrence after several ineffectual and incomplete operations. When the ulcerated cavity is limited by the osseous orbital walls, it is extremely difficult if not absolutely impossible to realize a distribution of radioactive foci within this cavity, in such a manner as to secure an equal irradiation to the proper depth over the necessary surface. If the ulcer involves most of the orbit and is adherent to the underlying bone, it is improbable that a cure can be effected by radium therapy because of such unequal radiation. Röntgen therapy is then the method of choice in such a case, because it permits a very great focal distance and thereby eliminates the danger of unequal irradiation.

More or less radio-necrosis of the bone of the orbital wall is an inevitable sequel to radium therapy of these vast, adherent cancerous ulcers. After the treatment, the neoplastic tissue disappears in three or four weeks, leaving an exposed, mortified, osseous surface. It is very dangerous to attempt surgical ablation of these areas of osteo-necrosis; it is better to let the process evolute spontaneously. Such bone necrosis is always accompanied by a chronic infection.

It is not impossible to obtain cicatrization without necrosis, in cancerous ulcerations involving the entire orbit, by the

employment of X-rays. When a patient presents himself with an epithelioma involving the eyeball, it is unwise to practice enucleation prior to X-radiation: the eye in situ will obviate radio-necrosis, and the eye itself, condemned by the neoplasm, can not be further injured by the rays.

Statistics of the Radium Institute.

The total proportion of completely healed cancers was 66.6%. The proportion of local cures by radiation measures was 74.5%. Of cancers localized to the eyelids, 72.9% were cured. Localization to the periorbital integument alone, furnished a total of 91.8% cured: involvement of eyelid and corresponding periorbital skin—61.1% cured. Eighty per cent of the histologically verified epidermoid carcinomas (4 out of 5) obtained local cures. Of the intermediate variety, 66.5% have been cured: of the non-epidermoid, 58.5%. If these have been correctly treated, one might conclude that the epidermoid carcinomas heal locally more readily than do the non-epidermoid variety.

Ocular Complications Secondary to Radiotherapeutic Treatments.

At the Radium Institute, no changes have been observed in the transparency of the vitreous body, the lens and the cornea. There have been no noticeable modifications in accommodation, and no alterations in retinal function subsequent to therapeutic irradiation in this region.

An acute conjunctivitis, transient and benign, with accompanying redness, photophobia, lachrymation and foreign body sensation, nearly always follows irradiation.

The eyelashes and the eyebrows, which are less radiosensitive than the scalp hair and the beard, may fall out, but the majority will usually grow again after varying time intervals.

The dose of radiation necessary for complete sterilization of the neoplastic cutaneous tissue is generally slightly less than the epidermicidal dose. However, the skin of the eyelids and the periorbital integument is practically always the site of a lesion, termed by the French, radio-epidermitis. This makes its debut about eight to twelve days after the treat-

ment. The epidermis is injured and later undergoes desquamation, but healing readily ensues, with no scar formation and no contractural deformities.

In only two instances have the clinicians at the Radium Institute observed the complication of irido-choroiditis with glaucoma, attributable to radio-lesions of the vascular membrane of the eye.

Therapeutic Indications.

I. *The Rôle of Surgery Alone.*

(a) When the lesion is very small, limited to the skin, and easy to remove totally with a good margin of healthy skin, it should be surgically excised under regional anesthesia without functional and cosmetic changes. This simple and rapid method respects the anatomical and functional integrity of the eye and constitutes a biopsy, the histological examination of the tumor confirming the diagnosis of epithelioma. A cancer on the margin of the lids cannot be easily surgically excised without leaving a defect or requiring a plastic repair.

(b) When a primary treatment by radiation has failed to cure an operable epithelioma, it is better to employ surgical removal for the second treatment, rather than further irradiation.

II. *The Rôle of Radiotherapy.*

(a) In a large ulcerated territory, such as the orbit, the neoplastic tissue varies several centimeters in distance from the orbital margin, consequently the X-rays are better than radium here because with the former it is possible to employ a focal distance of fifty centimeters or more, thereby equalizing the dose on the surface and in the depths.

(b) In all other cases, radium therapy is preferable. If the tumor is intraocular and radiosensitive, radium therapy is deemed better than surgical enucleation.

(c) When the X-rays have failed in the initial treatment, the chances of curing the tumor are minimal, but subsequent efforts should be made with radium rather than with further X-radiation.

(d) In epitheliomas of the skin, one is not justified in employing irradiation as a routine post-operative measure for the prevention of recurrences.

The Rôle of Röntgentherapy.

For the ordinary superficial epitheliomas a kilovoltage of 100 to 120, and a filtration of three to five millimeters of aluminum is generally sufficient. In the deeply infiltrating, anfractuous and ulcerative lesions high voltage is preferable, with a thicker filtration, such as one and one-half millimeters of zinc.

The dose given should be equally distributed and should be always sufficient to produce a radio-epidermitis. The focal distance (anticathode-skin) increases with the extent of the neoplastic surface and with the depth of neoplastic infiltration.

The method of fractioning the dose into little parts administered over a long time is to be condemned. To give the total dose in one seance is better, but this produces a very strong reaction. The most satisfactory plan is to distribute the dose in several seances over several days.

A sheet of lead one millimeter in thickness is moulded over the lesion; the under surface of this lead plate is lined with rubber to absorb the secondary rays given off by the lead. A windowed orifice is cut through the lead so that the lesion and a marginal area of 10 to 15 millimeters of surrounding skin is exposed to the action of the Röntgen rays. The eye is protected by lead plate two millimeters in thickness.

The Rôle of Radium Therapy.

The focal distance of the radium from the skin depends on the nature and the type of the lesion to be treated. This distance is obtained by the intervention of a wax, which is transparent to the gamma rays of radium. The formula of this wax is as follows; pure beeswax—100 grams, paraffin fusible at 62 degrees Centigrade—100 grams and finely sifted sawdust—20 grams. This mixture is melted into sheets one centimeter thick. It softens readily in hot water at 48 degrees Centigrade and is moulded over the tumor until it hardens into a permanent moulage. It can be sterilized at 120 degrees Centigrade and used again. It is said that this wax has

approximately the same absorption coefficient as the skin. It is also maintained that, unlike dental modeling compound, it gives off no secondary beta rays during gamma permeation, This wax was devised at the Radium Institute by Doctors Esguerra, Monod and Richard. If the skin cancer is small and flat or situated on the eyelids, the focal distance may be only 5 to 8 millimeters, but if it is an elevated or large lesion, the distance is correspondingly greater, as from one to one and a half (1½) centimeters.

The time of application of radium is extended over four to eight days, in order to destroy the "mother cells" which divide at successive intervals and therefore at some time pass into the phase of maximal sensibility (Law of Bergonie and Tribondeau). The time is seldom less than four days, but may be as many as eight days, and the radium may be applied for twelve hours daily in order to obtain the required dosage, although eight hours daily is preferable. This discontinuous application is indispensible in the treatment of little epitheliomas on the free border of the eyelid. In the baso-cellular epitheliomas this long duration of application is less important than in the spino-cellular.

In America the dosage is expressed in terms of "milligram hours" or "millicurie hours," which is a constant value, being the dose of emission. It is easily computed by multiplying the intensity of the radiation (*i.e.* quantity; milligrams of radium or millicuries of radium emanation utilized) by the duration in hours of the application. The dosage notation used throughout France, makes the dose proportional to the quantity of radium destroyed during the course of its application: this notation (Debierne and Regaud, 1914; Regaud and Ferroux, 1919) is preferable because it is commodious and equally applicable to tubes of radium or of radon. Let us assume that the total therapeutic value of one millicurie of radium emanation is one hundred and thirty-three (133) millicurie hours. Therefore one millicurie destroyed is the equivalent of 133 millicurie hours or of 133 milligram hours. Or one milligram of radium acting for 133 hours may be expressed in terms of dosage as one millicurie destroyed.

In a general manner, the dose per unit of surface is augmented with the thickness of the intervening wax (focal

distance), augmented with the thickness of the platinum filter, diminished with the extent of the surface radiated, without speaking of the influence exercised on the estimation of the dose by biological factors such as differences in radiosensibility. This dose varies from 0.8 to 5. millicuries destroyed per square centimeter of surface radiated, *e.g.* for a small epidermoid cancer, such as two square centimeters in area, the dose may be as high as four and a half (4½) millicuries destroyed per square centimeter of tumor, but for large cancers, such as twenty-five square centimeters in area, the dose is often only two millicuries destroyed per square centimeter of tumor.

Either radium or radon (emanation) may be employed. The tubes containing this radioactive substance have walls of platinum either 0.5 or 1 millimeter in thickness. Each tube may contain 2 or 3 milligrams of radium, the number of tubes being increased for larger lesions.

The mobility of the eyelid renders the application slightly difficult: sometimes the wax is folded, cuff-like, over the eyelid margin and the little tubes of radium distributed over its outer surface with a coating of lead and wax still more external for protection. This moulage is introduced over the lid after the conjunctiva has been anesthetized. To facilitate the application of the wax moulds on whose external surface the radium is buried, it is occasionally necessary to continue the wax over the nose for the purpose of support.

I wish to express my gratitude to Professor Claude Regaud, Director of the Radium Institute of the University of Paris, and his able colleagues, Dr. Lacassagne, Vice-Director, Dr. Monod, radium therapist and Dr. Coutard, Röntgenologist, for the information contained herein and for the kindness shown to me during my studies in their institute.

REFERENCE.

1. Regaud, Cl., Coutard, H., Monod O., and Richard G. "Radiotherapie des Cancers de la Region Orbito-palpebrale." *Annales d'oculistique*, T. CLXIII, Janvier, 1926.

BLUE SCLEROTICS AND BRITTLE BONES: REPORT OF OCCURRENCE IN MOTHER AND CHILD.

By Dr. SAMUEL P. OAST, New York.

UNUSUALLY deep blue sclerotics have been observed and reported in available literature since the earlier part of the nineteenth century. It is of much interest to observe in these earlier records the confusion which existed as to the true nature of the anomaly. In 1841 Von Ammon described a "melanosis of the eyeball" in which he considered the condition one of diffuse pigmentation of the sclera.

At about the same time, Liebriech, in the French Encyclopedia of Ophthalmology, spoke of cases of cyanosis of the eyeball describing a similar appearance, but in one of his appended case reports mentions the post mortem finding of a tumor which was judged to be the etiologic factor causing the discoloration of the sclera. Mention of other cases were made shortly after this; by Cornaz in his "Essay on Abnormalities of the Eye," published in 1862, and by the Irish ophthalmologist Wilde, at the same period. But these records are very incomplete, and for the most part confine themselves solely to casual appearances of the eye, with no histories and no findings which would enable us to judge whether they were all cases in the same category. The family histories were not given; therefore it is impossible to examine into the interesting familial phase, and no mention was made of any association of fragile bones.

Since the opening of the twentieth century, numerous articles have appeared describing the familial occurrence of this blue discoloration of the sclera together with great fragility of the bones, and in recent years it has been observed that

[1] Read before Eye Section, N. Y. Acad. Med., Dec. 27.

progressive deafness due to otosclerosis is a very frequent accompaniment of the anomaly.

Two of the publications put forth during recent years rise almost to the importance of monographs—those of Edith Bronson, which appeared in 1917, and of William Stobie in 1924, both in Great Britain. Families presenting this remarkable series of physical peculiarities have been observed and studied in Sweden, Holland, Germany, several parts of the British Empire, and in the United States. Only in France do there seem to be few families whose members are excessively blue-eyed and abnormally brittle, growing deaf as they grow older.

To Eddowes, who published in 1900 an account of "Dark sclerotics and fragilitas ossium," may be ascribed the honor of first calling general attention to the familial nature of this remarkable syndrome. John Spurway had four years earlier written a short paper concerning "Hereditary tendency to fracture" which he sent to the British Medical Journal, wherein we find the following observation: "The only other feature I have noticed common to many members of the family is a very curious bluish tinge of the eyeball, which in some is very marked." Eddowes, however, did more than remark upon the blue sclerotics in passing. In 1880, when a general practitioner, he had as a patient a child who had suffered no less than ten fractured bones, and whose eyes presented a most peculiar bluing of the scleræ. When twenty years later a girl with a similar discoloration of the eyeball came to him for ophthalmologic examination, he recalled the brittle little boy seen long before, and asked this child if she had ever broken any bones. His curiosity was fully justified by the elicitation of a history which showed that the child's father had the same "queer" blue eyes, and that both of them had suffered numerous fractures.

Following the publication of Eddowes' cases, similar family histories appeared in medical literature with ever-increasing frequency. This literature is of the highest interest, but despite the large amount of careful work which appears to be represented, practically nothing definite in regard to etiology has as yet been established. The literature for the past ten years begins with the exhaustive article by Bronson already

referred to, and the report in 1918 of the two Dutch investigators, Van der Hoeve and de Kleyn, who emphasized especially the ophthalmological aspects of the cases which they examined. That same year Rothschild made blue scleræ and brittle bones the subject of his inaugural dissertation at Munich, but his remarks did not add much to the sum total of our knowledge of the condition under discussion.

The case histories in all the reports are strikingly similar, and it is noticeable that the blue sclerotics are the most constant phenomenon, otosclerosis on the other hand appearing with the least frequency. Bronson's summary of what was known of the etiology of the eye condition at the time she wrote it is so concise that I feel I cannot improve upon it, so will quote it verbatim:

The etiology of the blueness has not been determined. Practically all writers now agree that it is due to increased transmission of the color of the choroidal pigment, not to any inherent coloring of the sclerotics. Eddowes suggests that "the transparency of the sclerotics indicated a want of quality or quantity of the fibrous tissues forming the framework of the various organs of the body, and probably explained the want of spring or toughness in the bones of these individuals." Stephenson agrees with this statement. Peters thinks there is probably an actual thinning of the sclerotics. Conlon considers an increase in transparency the more likely hypothesis, suggesting that if there were thinning of the sclera one would expect to find cases of buphthalmos in these families, or at least some evidence of axial myopia. Fridenberg, who examined the eyes in Hermann's patient, also thinks that the assumption of thinning of the sclerotic as a cause of increased color transmission is disproved by the absence of any record of a case in which the distension of the globe, as in infantile glaucoma or hydrophthalmos, was present; also, there is no mention of the presence of coloboma or posterior staphyloma. He suggests that the blue sclerotics and the lead-gray iris as well are due to transparency dependent upon the absence of lime salts in the connective tissue elements of the sclera and the iris.

Buchanan made an histological examination of a blue sclerotic in 1908. He found the cornea three-fifths and the

sclera one-third the usual thickness. There was a decrease in the number, but no change in the size of the sclerotic fibres. However, there is no history of fractures in this case, and one has no reason to assume that it belongs to the fragilitas-blue sclerotic group.

While Bronson was making her study of the Curry family of Edinburgh, one of the children—an infant 11 months old—died of pneumonia, and permission to remove and examine one eye was obtained. J. V. Paterson, ophthalmologist to the Royal Infirmary of Edinburgh, examined the slides made from this dissection and reported the sclerotic of normal thickness and the size and number of fibers normal for a child of the subject's age. "Since this infant had the typical blue sclerotic the more probable theory of its etiology is that of increased translucency rather than decrease in thickness."

Voorhoeve's Dutch family showed hemophilia in several members in addition to brittle bones and blue sclerotics; four had typical labyrinthine deafness. His explanation of all the anomalies is an hereditary inferiority of the mesenchyme, in that the family for five generations showed a vast number of congenital abnormalities of mesenchyme organs; glandular tuberculosis was repeatedly noted, for example, indicating lessened resistance to disease of organs of this type. The patient described by Blegvad and Haxthausen had zonular cataract in addition to the blue sclerotics and likewise presented a macular atrophy of the skin which these authors believed to be another manifestation of the anomalous condition evidenced by the classic syndrome. She had no subjective ear symptoms. Marconi's patient was a young soldier, examined under conditions which made study of family history impossible. The patient also showed abiotrophy of the vascular system. Blatt's report concerns a woman of 52, who presented Eddowes' syndrome, and had for three years suffered from a basal cell carcinoma upon the ball of the left eye, superimposed upon a preëxisting pterygium. The growth was very superficial, a fact which the author attributed to a special power of resistance and toughness of the blue sclera which, although thin, resisted the interocular pressure. The tumor was removed, and up to the time of report showed no signs of recurrence. A typical family history was elicited,

and the author accepts the theory of mesodermal inferiority transmitted from one generation to another, as the cause of the manifestations ocular and osseous which these subjects display.

Another Dutch writer, Bolten, observed a large family, 17 members of which, in four generations, showed the characteristic blue sclerotics. Fragilitis ossium did not appear to be in evidence, but there were nervous, trophic, and vasomotor disturbances in abundance. The blue sclerotics he attributed to trophic insufficiency which he regarded as being closely related to disturbance in endocrine function, which is probably inherited. He rejects the theory that abnormality of a single layer of the blastoderm is responsible for the various anomalies, but prefers to believe it is related to the vegetative system—derived from the epiblast—as well as imbalance of the endocrines, which are derived from epiblast and hypoblast.

The "Oxford Family" was very completely studied by Stobie, whose table includes 66 individuals covering five generations. Eighteen members—eight males and ten females—had blue sclerotics, and most of these presented the other abnormalities characteristic of the syndrome. "The transmission of the features under review," he tells us, "is direct from one generation to the next. There is no instance of a generation having been skipped. It is transmitted through both male and female, and no instance has come under notice in which an unaffected member has an affected descendant." The blueness of the sclerotics did not show any relation to the grade of severity of the other manifestations. Blue sclerotics without evidence of fracture occurred in ten instances; with fracture in eight; and were associated with deafness in but four members of the family. "A striking feature was the appearance of the iris in the patients examined. It seemed to lack the normal clearness and to present a 'muddy' appearance. One of the causes of this may be an abnormal state of the cornea." This author feels that even though there is no definite evidence pointing to an endocrine imbalance as the etiologic factor of this curious inheritance, the appearance of the patients constantly brings the idea forward. Behr describes bulging of the cornea in association with blue

sclerotics, and Mr. H. P. Adams tells me that in cases of conical cornea he has had the impression for several years that there may be a defect in the internal secretions. Certain cases of keratoconus seen at the Oxford Eye Hospital suggest this etiology strongly. They present an overgrowth of hair on chin and breasts, a yellow waxy skin, and a premature wearing away of the teeth."

The most recent report that I have found is that of J. Albert Key in the *Archives of Surgery* for last October. He gives a detailed case report of one patient, and a summary of her family history, and goes over the existing literature at considerable length. In the section on the eye findings he notes the mention of embryotoxon by Peters, (1913) and that it is also present in a number of the families reported since 1900, including one of Van der Hoeve and de Kleyn's families, though absent in the other. A slight embryotoxon was present in his own case. The Dutch authors, just mentioned, also noted cataract in two cases, and some of those patients refracted showed astigmatism and hypermetropia; myopia was noted five times in one of Van der Hoeves families.

In the mother and son presented here the typical azure blue sclerotics are shown. The baby is free from any other stigmata of the syndrome but the mother exhibits the tendency to brittle bones, as evinced by the fact that on two separate occasions her metacarpal bones have been fractured from seemingly trivial causes. There is no deafness.

I have not been able to develop any familial characteristics whatever, and the baby shown here is the only child. Her mother and father are both living and show nothing pertinent. The other members of the family are somewhat hazily recalled but there certainly seems to have been no outstanding features of the condition present.

It is interesting to note that the mother is myopic and the child hyperopic. The mother's refraction is:

R −3.00 sph. −1.00 cyl. x 180 $\frac{10}{10}$
L −4.00 sph. −1.75 cyl. x 180 $\frac{20}{100}$

She has been wearing the same correction for the past six years and after a recent examination under homatropine I

found no reason for making a change. The fundi do not show any of the usual signs of progressive myopia, and the amblyopia may be explained by the degree of error in the right eye and in the left by the ansometropia.

The baby under atropine retinoscopes +4.00 in each eye at a meter's distance. The fundi are normal and the vision seems good.

I wish to acknowledge my indebtedness to Dr. Clyde E. McDannald from whose clinic at the New York Eye and Ear Infirmary these cases are reported.

BIBLIOGRAPHY.

1. BRONSON, E. "On fragilitas ossium and its association with blue sclerotics and otosclerosis." *Edinburgh M. J.*, xviii (3d Ser.), 240, April, 1917.
2. REMY, C. E. "Blue sclerotics; their relation to multiple fractures in childhood." *Railway Surg. J.*, 1917, xxiii, 327.
3. REYE. "Über diffuse Blaufarbung der Sklera." *Deut. med. Wchnschr.*, xliii, 125, 1917.
4. ROTHSCHILD. "Ueber die Vereinigung von blauer Sklera Knochenbruchigkeit nebst kasuistischen Mitteilungen." *Inaug. Dissertation*, München, 1917.
5. SPURWAY, J. "Fragilitas ossium, blue sclerotics and otosclerosis." *British M. J.*, i, 826, 1917.
6. VOORHOEVE, N. "Het ziektebeeld der blauwe sclerae in verband met andere aageboren afwikingen." *Nederl. Tijdschr. v. Geneesk.*, 1917, i, 1399.
7. VAN DER HOEVE, J., DE KLEYN, J. "Blaue Sclera, Knochenbruchigkeit und Schwerhorigkeit." *Arch. f. Ophth.*, 1918, xcv, 81.
8. HARVIE, J. B. "Blue sclerotics with brittle bones." *Albany M. Ann.*, May, 1918, xxxix, 169.
9. CONLON, F. A. "Blue sclerotics; a note upon association with otosclerosis." *Amer. J. Ophth.*, i (3d Ser.), 726, Oct., 1918.
10. MARCONI, A. "*Contributo allo studio della fragilita ossea associata a sclerotico azzura.*"
11. STENVERS, N. W. "Roentgenologische Bemerkungen zur Vorhergehenden Arbeit von J. van der Hoeve und J. de Kleyn, "Blaue Sklera, Knochenbruchigkeit und Schwerhorigkeit." *Arch. f. Ophth.*, xcv, 94, 1918.
12. VOORHOEVE, N. "Blue sclerotics, in connection with other hereditary or congenital abnormalities." *Lancet*, ii, 740, November 30, 1918.
13. CASSIMATIS. "Cyanose simple de la sclerotique congenitale et familiale." *Clin. Opht.*, 1917–18, xxiii, 714.

14. FREYTAG. "Ueber blaue Sklera und Knochenbruchigkeit." *Klin. Monatsbl. f. Augenhlk.*, lxvi, 507, 1921.
15. BLEGVAD, OLAF, HAXTHAUSEN, HOLGER. "Blue sclerotics and brittle bones; with muscular atrophy of the skin and zonular cataract." *British M. J.*, ii, 1071, Dec. 24, 1921. Also appeared in *Hospitalstid*, lxiv, 609, Sept. 16, 1922.
16. ALEXANDER, J. B. "Fragilitas ossium associated with blue sclerotics in four generations." *British M. J.*, i, 667, April 29, 1922.
17. GUTZEIT, R. "Ueber blaue Sklera und Knochenbruchigkeit." *Klin. Monatsbl. f. Augenhlk.*, lxviii, 1922.
18. STEWART, H. "Fragilitas ossium associated with blue sclerotics." *British M. J.*, ii, 498, Sept. 16, 1922.
19. BOLTEN, H. "Blauwe sclerae." *Nedr. Tidj. Geneesk.*, 174, Oct. 27 1923.
20. STRAAT, H. L. "Blauwe sclerae, etc." *Nedr. Tidj. Geneesk.*, i, 151, Jan. 13, 1923.
21. BIGLER, MAX. "Über das gleichzeitige Vorkommen von Osteopsathyrose und blauer Verfarbung der Skleren und Otosklerose." *Ztschr. f. Hals., Nasen, u. Ohrenhlk.*, 1923,v, 233.
22. AUBINEAU, E. "Le syndrome des sclerotiques bleues." *Ann. d'oculistique*, clx, 337, May, 1923.
23. BLATT, NIKOLAUS. "Ein Fall von blauer Sclera, Knochenbruchigkeit und primarem epibulbaren Carcinom von basocellularen Charakter." *Arch. f. Opth.*, March 31, 1923, cxi, 54.
24. SINGER, S. "Ein Beitrage zur Frage der Kombination abnormor Knochenbruchigkeit und blaue Skleren." *Ztsch. f. Klin. Med.*, xcvii, 43, May, 1923.
25. STOBIE, WM. "The association of blue sclerotics with brittle bones and progressive deafness." *Quarterly Journal Med.*, xvii, 274, Apr., 1924.
26. BLENCKE, A. "Ueber das gemeinseme Vorkommen von Knochenbruchigkeit mit blauen Skleren und Schwerhorigkeit." *Ztsch. f. orthop. Chir.*, May 17, 1924, xlv, 406.
27. WEICHMANN, E. "Zur Klinik der sogenannten blauen Skleren." *Münch. med. Wchnschr.*, lxxii, 213, Feb. 6, 1925.
28. KEY, J. ALBERT. "Brittle bones and blue sclera." *Arch. Surg.*, xiii, 523, Oct., 1926.

PHOTOGRAPHIC HISTORY OF A TRAUMATIC RETINO-CHOROIDITIS

By Dr. ARTHUR J. BEDELL, Albany, N. Y.

(With eight illustrations on Text-Plate XIV.)

THE general question of pigmentation, especially the migration of pigment, holds the attention of all medical men. The association between certain types of malignancy and various forms of benign growths is sometimes a question of the type and arrangement of the pigmented masses. The retina and choroid offer a field for the careful observation of these changes, notably in choroiditis and retinitis pigmentosa. As far as we know, there is no pictorial story showing the progressive alteration in the retinal pigment after an injury.

The following case is presented to demonstrate such clinical changes and give proof of the value of fundus photographs.

J. S., a fifteen year old boy was struck over the left frontal region by a phonograph record, which was hurled twenty feet. This caused an extensive laceration of his eyebrow. His physician closed the cut with several sutures. He came under my observation May 30, 1927, three days after the accident.

The right eye is and has been negative. Vision $\frac{20}{15}$ Type I. Pupil 3*mm* regular, active, media clear, disk clear, retina thin showing at the nasal side the underlying choroidal circulation.

The left eye vision $\frac{20}{200}$. No scars about the eyeball. Cornea clear. Anterior chamber of normal depth. Pupil widely dilated, atropin, 7 x 7.5*mm* slightly ovoid. Several large shreds of blood in the vitreous, through which, however, the pale fundus is seen. The disk is not outlined, the retina edematous with some pre-retinal blood. After atropin the media cleared sufficiently in the next twenty-

FIG. 1.—May 31, 1927. Edema of retina—pre-retinal hemorrhage—dark red macular region, no nerve outline.

FIG. 2.—June 1, 1927. Less edema. Hemorrhage absorbing. Faint pigmentation.

FIGS. 3, and 4.—June 3, 1927. Stereoscopic. Outline of area in which migration of pigment is taking place. By contrast, the macula is clear.

FIG. 5.—June 15, 1927. Dense pigmentation, paler islands between dark masses.

FIG. 6.—Greater definition of black pigmentation and sharper margin of the uninvolved portion of the fundus.

FIGS. 7, and 8.—Stereoscopic. Final stage. Disc clearly seen. Extensive retinal destruction with pale background and coal black mass of pigment. In the vitreous at the site of the blood clot an irregular pigmented triangle persists. The macular region is heavily pigmented.

FIG. 1.—May 31, 1927. Edema of retina—pre-retinal hemorrhage—dark red macular region, no nerve outline.

FIG. 2.—June 1, 1927. Less edema. Hemorrhage absorbing. Faint pigmentation.

FIGS. 3. and 4—June 3, 1927. Stereoscopic. Outline of area in which migration of pigment is taking place. By contrast, the macula is clear.

FIG. 5.—June 15, 1927. Denser pigmentation, paler islands between dark masses.

FIG. 6.—Greater definition of black pigmentation and sharper margin of the uninvolved portion of the fundus.

FIGS. 7. and 8.—Stereoscopic. Final stage. Disc clearly seen. Extensive retinal destruction with pale background and coal black mass of pigment. In the vitreous at the site of the blood clot an irregular pigmented triangle persists. The macular region is heavily pigmented.

ILLUSTRATING DR. ARTHUR J. BEDELL'S ARTICLE, "PHOTOGRAPHIC HISTORY OF A TRAUMATIC RETINO-CHOROIDITIS."

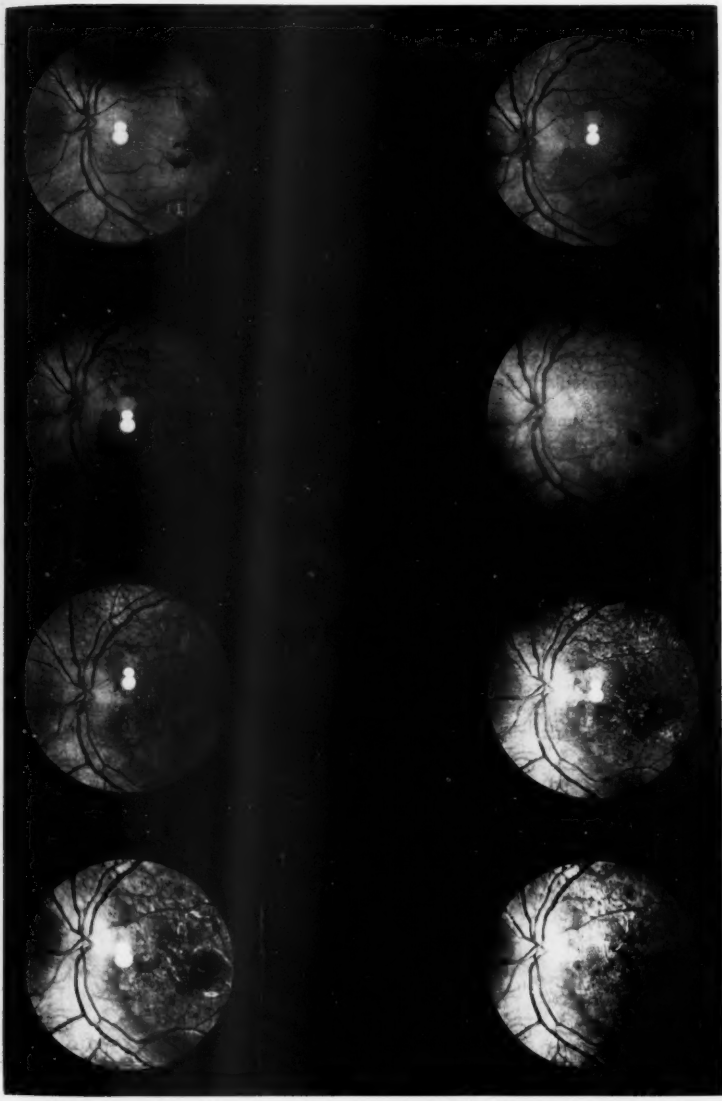


FIG. 1

FIG. 2

FIG. 3

FIG. 4
Stereo

FIG. 5

FIG. 6

FIG. 7

FIG. 8
Stereo

UNIV. OF MICH.

four hours to enable us to take the first photograph. This shows (Fig. 1) that there is no outline of the nerve, the entire retina is pale, edematous, except a bright red macular area, below and to the disk side of which there are two sub-hyaloid hemorrhages.

Twenty-four hours later, (Fig. 2) a very marked change has taken place in the entire fundus. The picture shows that there is a suggestion of nerve outline, the gray edema markedly less, a slight absorption of the upper blood clot and a greater definition of all the retinal vessels. The macular region is less evident by contrast.

Two days after the preceding picture was taken there is practically no change in the general appearance of the nerve or blood vessels. There is, however, a difference in the retina, a paling with migration of pigment. (Figs. 3 and 4, Stereo.) This is particularly noted to the lower temporal side of the nerve in a rounded area. The blood clots are absorbing. The smaller mass has entirely disappeared and the larger is shrinking, it is thinner and covers less surface. A careful study of the stereo picture shows the translucency of the retina, the edema of optic nerve, especially to the nasal side, the mottled appearance of the retina with beginning pigment migration in the superior temporal one-third. The macular region is irregular in outline.

Twelve days later, that is nineteen days after the accident, the optic nerve is clearly outlined. The photograph (Fig. 5) illustrates the great migration of pigment, the thinning of the retina below and greater destruction in the macular region. Far in the periphery at the temporal side, there are two distinct ruptures in the choroid. These are in the extreme outer portion so that they are only photographed with considerable difficulty and much distortion, and are not visible in the picture shown.

Fifteen days later (Fig. 6) pigmentation of the fundus is greater. Coal black flecks are scattered all over the region previously described as being involved.

On November 2d (Figs. 7 and 8, Stereo) about five and one half months after the accident, vision $\frac{8}{200}$, pupil 5*mm* regular, active, media clear. There is very intense pigmentation with considerable thinning of the retina. An ovoid area in the macular region is most densely pigmented and shows to the

lower outer side a highly refracting zone resembling a cyst wall. The pallor of the nasal half of the retina is greater and the choroidal circulation easily seen through it. It is to be noted, however, that the right fundus shows a similar condition in this part of the retina. In the region of the smaller pre-retinal hemorrhage, there is a black mass in the vitreous.

The probability of extensive destruction of the retina following an injury to or about the globe must always be considered. The coöperation of the patient can be more easily secured when he can follow the course of his disease by looking at the photographs and finally the medico-legal importance of such evidence is of untold value.

NOTES ON TWO EARLY AMERICAN WORKS ON THE EYE

By Dr. GEORGE H. JACKSON, Jr., Chicago.

(*With three illustrations on Text-Plate XV.*)

THAT specialization in the practice of ophthalmology began in America in the early part of the nineteenth century is determined by the fact that at this period there were men who devoted their efforts almost entirely to the treatment of diseases of the eye, and two hospitals for the care of patients with ophthalmological conditions had been inaugurated by 1820. Dr. George Frick, of Baltimore, and Dr. Isaac Hays, of Philadelphia, to mention only two of the early American ophthalmologists, were practicing their specialties before 1823.

Dr. Elisha North founded the first eye dispensary in America at New London, Connecticut, in 1817, and three years later began the eye work at the New York Eye and Ear Infirmary under the direction of Dr. John Kearney Rodgers and Dr. Edward Delafield. It is of interest to note that ophthalmology was a recognized specialty, and that eye institutions were in operation before there had been published any text books on eye diseases in America. The first text book published was John C. Saunders' *A Treatise on Some Practical Points Relating to Diseases of the Eye*, which was brought out by B. Warner at Philadelphia, in 1821. This work is an example of the tendency at that time to reproduce here, the works of the leading English and Scotch authorities with or without notes or additions by American men. The first text book by an American author was Charles Frick's *A Treatise on the Diseases of the Eye*, published in Baltimore in 1823.

There are two small volumes to which I wish to call attention as examples of early American works on diseases of the

eye. One belongs to the class of English reprinted works, the other is an American classic worthy of a long search among dusty books in bins or on shelves. I say bins, because it is from a book-bin in front of an old shop that I rescued one of the volumes here described.

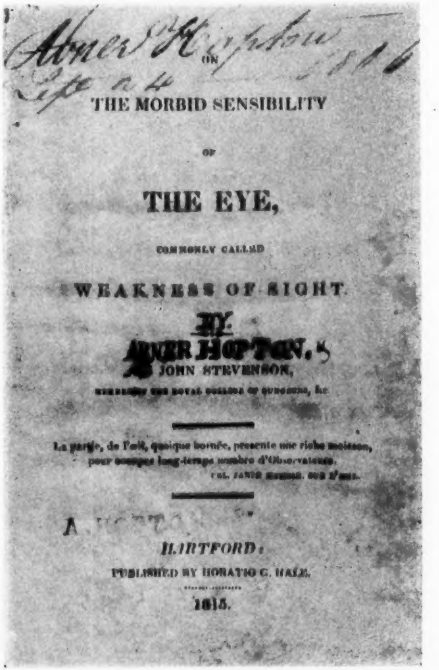
The first book is a duodecimo published in Hartford, Connecticut, before hospitals for eye diseases had been established, and even before the first specialist in eye diseases had graduated from medical school. It is an American reprint of John Stevenson's ***On Morbid Sensibility of the Eye, Commonly Called Weakness of Sight***, published by Horatio G. Hale in 1815, six years before a text book had appeared. The title page of this volume is shown in Figure I.

The English edition had appeared in London in 1810, as an octavo of 108 pages, but the American edition has only 99 pages. On the reverse of the title page, as well as at the foot of the last page of the text, appears a small notice to the effect that the little book was the work of "Loomis & Richards, printers; Middletown, Con." On the unnumbered page 3 is a dedication to Lady Viscountess Perceval, and on the fifth page begins the introduction. For binding, sheepskin was used and in the copy before me it has been well preserved. The paper upon which the book is printed is rather heavy, bears no water-mark, and has been so folded that the signatures are of six leaves each, measuring 175 by 105 *mm.* The heavy type used and the wide spaces between the lines make the work one easy to read.

Although there was little new knowledge brought forth in this publication, it is worthy of preservation and study as an item illustrative of medical progress in a specialty which was early established in our country.

The second item is James Bolton's ***Treatise on Strabismus***, published at Richmond, Virginia, in 1842. The author of this little book was born in Georgia in 1812, and, after graduating in medicine at the College of Physicians and Surgeons, in New York, in 1836, studied under John Kearney Rodgers. It was probably while in New York under Rodgers' instruction that Bolton became interested in work on the eye, because it is to Rodgers that the book is dedicated as an acknowledgment of his valuable instruction in Ophthalmic Surgery.

ILLUSTRATING DR. GEORGE H. JACKSON'S ARTICLE, "NOTES ON TWO EARLY AMERICAN WORKS ON THE EYE."



ON

THE MORBID SENSIBILITY

OF

THE EYE,

COMMONLY CALLED

WEAKNESS OF SIGHT.

BY

ABER HOPTON,

JOHN STEVENSON,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS, &c.

La partie, de l'œil, quoique bornée, presente une riche moisson,
pour presque long-temps nombre d'Observateurs.

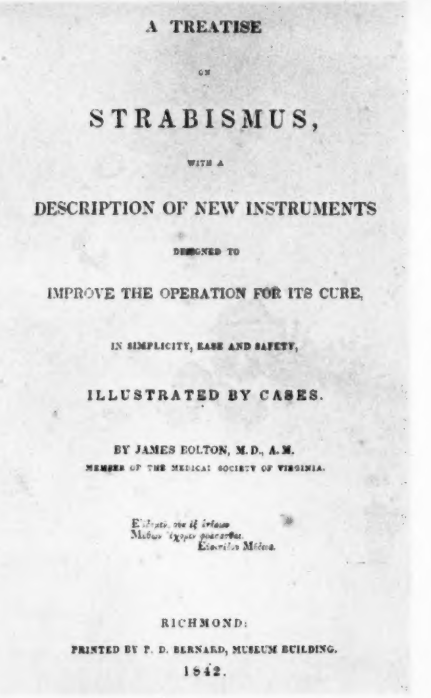
VOL. XXVII. Memoir. SUR L'ŒIL.

HARTFORD:

PUBLISHED BY HORATIO C. HALE.

1815.

FIG. I.



A TREATISE

ON

STRABISMUS,

WITH A

DESCRIPTION OF NEW INSTRUMENTS

DESIGNED TO

IMPROVE THE OPERATION FOR ITS CURE,

IN SIMPLICITY, EASE AND SAFETY,

ILLUSTRATED BY CASES.

BY JAMES BOLTON, M.D., A.M.

MEMBER OF THE MEDICAL SOCIETY OF VIRGINIA.

Ellipsis, ou il loisoit
Mettre toute pourvoirs.
Etienville Milton.

RICHMOND:

PRINTED BY P. D. BERNARD, MUSEUM BUILDING.

1842.

FIG. II.

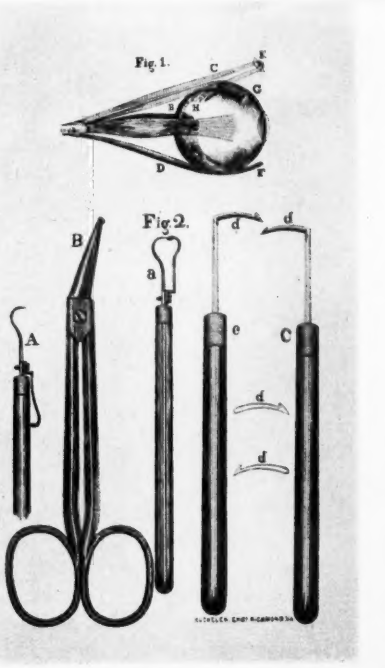


FIG. III.

UNIV. OF MICH.

This work of Bolton's is a rare classic and deserves a prominent place in a collection of books dealing with the history of American ophthalmological literature. It is a thin volume of only 36 pages, bound in very dark brown cloth, with an abbreviated title stamped in gilt on the front cover. It is essentially a Richmond product throughout. Bolton was living in Richmond the time of its publication, the title page (Figure II) states that the book was printed by P. D. Bernard at the Museum Building, and a small, faded, pink label inside the front cover shows that the binding was done by John B. Ege, of Richmond. Even the engraving of the plate showing the instruments (Figure III) was done by Suckelew, who was also a resident of Richmond.

No water-mark is seen in the paper of which the book is composed and the signatures are of six leaves, measuring 200 by 120 millimeters.

On page 15, is described in detail Bolton's method of performing the operation for strabismus and continuing further in the book, is described the new hook which he used to hold the eye while operating. He says, page 18, "The operation occupies from one to two minutes, when the patient has sufficient firmness to submit without resistance. The pain which it produces is very slight; indeed the patients on whom I have operated have complained most of a painful weary feeling of the eye, owing to their being obliged to have the eye kept open so long without winking. The front part of the eye becomes dry, and a smarting painful feeling ensues which is at first slight, but if not quickly relieved by winking, becomes almost intolerable. This occurred in the first two or three operations which I performed, and to obviate it, I invented the steel hook (A) with its guard, and I have been much gratified at finding it so completely successful, as to render the operation much more easily borne. In fact, I never allow the painful feeling, to which I have alluded, to continue, but permit the lids to close whenever the patient complains of it, as this indulgence is a great relief to him, and may be granted, leaving the hook upon the eye, without the slightest danger of injury to it or to the lids. Then by taking hold of the handle of the instrument, the operation may be immediately resumed, without going through the preliminary

steps, and without any effort on the part of the patient, either mental or physical. It does not appear to him like commencing the operation a second time, nor does it wound the parts again, as would occur with the retracting double-hook ordinarily used."

When one considers the rare good judgment which Bolton used, and the kindness toward his patients which the above quoted paragraph implies, one may easily understand why he was at the head of the profession in his state until the unhappy occurrence of the War of the Rebellion interrupted his work.

A WAY TO KEEP THE EYELIDS CLOSED AFTER INFILTRATION ANÆSTHESIA.[1]

By Dr. WILLIAM D. GILL, Captain, Medical Corps, United States Army, Washington, D. C.
Chief of Eye Clinic, Walter Reed General Hospital.

(With two illustrations on Text-Plate XVI.)

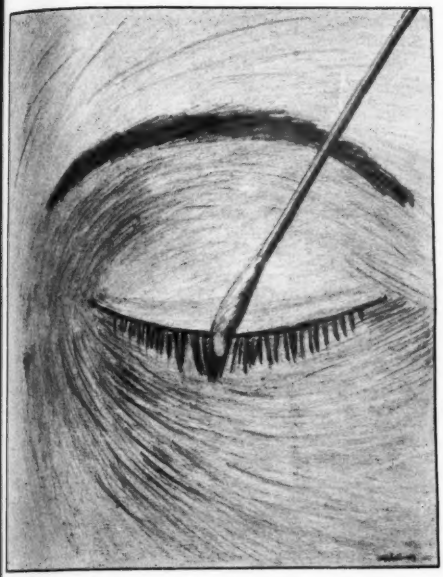
IT is widely recognized that akinesis of the orbicularis oculi muscle is a valuable procedure in certain operations upon the eye, such as cataract extraction, as it offers an efficient means of preventing the patient from forcibly closing the lids and thus acts as a safeguard against certain hazards incident to the operation, such as vitreous loss. However, once the operation is completed, the need for akinesis has passed, and the operator is then confronted with the problem of getting the lids into the normal position of repose prior to the application of the dressing. Usually the lids stand apart for a distance of a quarter or three-eighths of an inch, and no amount of effort on the part of the patient can effect a closure. One will usually be content with gently pressing the lids into apposition and applying the dressing in such a manner that there is a reasonable degree of certainty that they will remain in the desired position. It must be admitted though, that there is always the potential danger of dressings coming into contact with the cornea and inflicting more or less serious damage. The effect of the local anæsthetic used to produce akinesis of the orbicularis oculi muscle (usually 2% procain solution) may last for two or three hours and occasionally longer. The

[1] From the Department of Ophthalmology, Walter Reed General Hospital, Washington, D. C. Published with permission of the Surgeon General, U. S. Army, who is not responsible for any opinion expressed or conclusions reached herein.

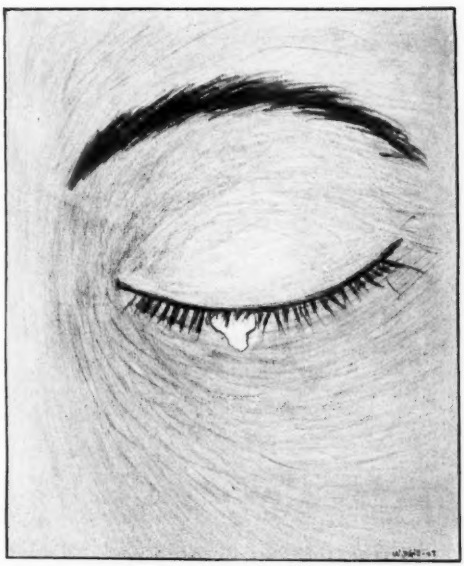
interval between the induction of motor paralysis and the return of the normal muscle tonus is in most instances comparatively short, but in this brief period considerable damage may occur. In order to prevent just such accidents the writer has resorted to a simple expedient which will hold the eyelids in approximation during the period prior to the return of normal tonus to the muscle. The method is applicable except in patients where the eyelashes have been trimmed unusually short, or as occasionally happens, where they are deficient or absent. Deformities of the lids may occasionally interfere and prevent its use. The method is as effective as it is simple, and is applied in the following manner: After completion of the operative work upon the eye, the lids are very gently approximated with the operator's fingers and a single droplet of flexible collodion is applied to a group of the lashes of the upper lid at its midportion. The small mass of collodion will soon become quite thick and adhesive, and should at that time be pressed into contact with the lower lid with the end of an applicator. The solution dries quickly and effectively maintains approximation of the lids. The application is made at one point only, and if this precaution is observed, there will be sufficient area left through which secretions may escape from the eye. Ointments may be introduced into the conjunctival cul-de-sac, but under such conditions care will be necessary to avoid getting the ointment on the skin of the lower lid, for if such takes place the collodion will not adhere to the skin, and failure will result. Collodion will likewise not adhere to a moist surface, therefore the skin must be thoroughly dry. When subsequent dressings are made the small flake of dry collodion may be lifted away from the lower lid by means of dressing forceps with a minimum of effort and with no distress to the patient. The simple procedure is not only effective in maintaining approximation of the lids during the period that the anæsthetic causes paralysis of the orbicularis oculi muscle, but is of distinct value in preventing apprehensive patients or those of inadequate mentality from accidentally or intentionally opening the eyelids underneath the dressings, and will effectually guard against such disastrous accidents as the lid becoming engaged in the corneal wound.

With the exercise of a reasonable amount of care there is no

ILLUSTRATING DR. WILLIAM D. GILL'S ARTICLE, "A WAY TO KEEP THE EYELIDS CLOSED AFTER INFILTRATION ANÆSTHESIA."



A droplet of collodion is applied to a few lashes at the center of the upper lid by means of an applicator wound with cotton. The collodion will soon become quite sticky, at which time the lashes covered with collodion are gently pressed into contact with the lower lid. Caution should be used to avoid accidental introduction of collodion into the conjunctival cul-de-sac.



The upper lid is anchored securely against the lower lid by means of the collodion and the patient is prevented from voluntarily opening the lids. The flake of dried collodion may be lifted away from the lower lid and removed from the lashes of the upper lid by means of a small tissue forceps when its period of usefulness has passed.

UNIV. OF MICH.

reason to suspect that the solution will get into the conjunctival cul-de-sac nor that it will produce irritation of the globe through evaporation of the solvent used in its preparation. An additional advantage is that the substance is waterproof and therefore will not be affected by the lacrimal secretion.

The method has served the writer satisfactorily for a number of years, and it is believed that its simplicity, effectiveness and ready availability warrant its more universal employment. It certainly overcomes one of the principal objections to orbicularis akinesis, and it is believed that its virtues are sufficient to strongly appeal to those doing ophthalmic surgery.

The accompanying illustrations show the various steps in the procedure.

EXPERIENCE WITH EPHEDRINE IN OPHTHALMIC PRACTICE.[1]

By Dr. MARK J. SCHOENBERG, New York.

EPHEDRINE is an alkaloid, first extracted from an Asiatic plant—Ephedra—by Nagai in 1887 (*Pharm. Zeit.*, 1887). The plant has been used as a drug in China for more than 5,000 years.

Ephedrine sulphate has been prepared in quite a pure condition in Lilly's laboratories and has been widely used for a number of conditions, like bronchial asthma, hay-fever, vasomotor rhinitis, urticaria, low blood pressure, headaches following spinal punctures, shock, circulatory collapse, Addison's disease. Ephedrine stimulates the nerve-endings of the sympathetic system and its action is similar to that of adrenaline. It is a depressant of the cardiac muscle. Injected intravenously or intramuscularly, it causes vaso-constriction and raises the blood pressure for a considerable length of time. Ephedrine dilates the muscles of the bronchi. Its oral administration causes at times symptoms of anxiety, and seems to be contraindicated in serious heart diseases.

The 1%–3% solution of ephedrine can be sterilized by boiling, without losing its properties. It does not spoil by standing.

The experience gained by the use of ephedrine in several hundred of my patients may be summarized as follows:

1. One to four drops of a 1%–3% aqueous solution of ephedrine instilled into the conjunctival sac, will dilate the pupil within 15–45 minutes.

2. The diameter of the dilated pupil ranges between about 3*mm* and 6*mm* and depends on such factors, as age, dark

[1] Read before Eye Section, N. Y. Acad. Med., Dec. 19, 1927.

adaptation, state of congestion of the conjunctiva and uvea, posterior synechiæ. The pupils dilate with greater ease and to a greater extent in patients of about 15 to 50 years of age; when the patients are kept in the dark, during the ephedrine instillations; when the eyes are not congested and when no synechiæ are present.

3. Ephedrine does not affect the accommodation to any appreciable degree if 2–4 drops of 1% sol. is used. My method was to test the patients with the Birkhauser type. The pupils react slightly to light and convergence, though under the influence of ephedrine.

4. It does not produce constriction of the conjunctival or episcleral blood vessels and no vascular engorgement follows the cessation of its effect.

5. It does not affect the intraocular pressure in non-glaucomatous eyes. Its influence in glaucomatous eyes has not been sufficiently studied to warrant any statement. Possibly the use of a stronger solution than 1% may affect the intraocular pressure readily in glaucoma. Inouye has reported on a case of an acute attack in a glaucomatous eye, following the use of ephedrine for mydriatic purposes. But this happened in 1889, when ephedrine was used in 4 and even 10 per cent solutions. (*Klin. Mon. f. Augenhlk.* 1889.)

6. The dilatation of the pupils is of a relatively short duration—enabling one however to make a careful ophthalmoscopic examination. It lasts 30 to 90 minutes—according to the age and state of the iris—and it disappears more rapidly when the patient uses his eyes for near or goes outdoors, exposing himself to broad daylight. Even with pupils dilated almost ad maximum convergence contracts them to one half or more of their size. A maximum dilatation of the pupils recovers slower.

7. In the majority of cases, ephedrine in 1% solution seems to act as well as a stronger solution and it does not irritate the conjunctiva.

8. Pilocarpin hydrochloride 1% solution contracts the ephedrinized pupil to its normal size, or to a smaller size—within 5–10 minutes (this in non-glaucomatous eyes).

9. So far, in several hundred patients—it did not cause any toxic manifestations.

10. It presents distinct advantages, as a mydriatic, over homatropin, atropin and cocain. Over homatropin and atropin, because its effect is of short duration; it is counteracted by pilocarpin; it does not affect the accommodation. Over cocain, because it causes no corneal anæsthesia and does not affect the corneal epithelium.

11. Ephedrine has the remarkable property of acting upon the sympathetic innervation of the dilator pupilæ without affecting the other extra-ocular sympathetic fibers: it produces no blanching of the conjunctivæ, no stimulation of the levator palpebræ and no exophthalmus.

In this respect it is destined to play an important rôle in experimental physiology.

12. Added to a novocain solution for injections in the tissues, it acts as a vaso-constrictor, if sufficient time (about 15–20 minutes) is allowed before the operation is commenced. In a few enucleations performed under local anæsthesia I found that the effect of ephedrine lasts longer than that of adrenalin.

We are told by pharmacologists that ephedrine acts like adrenalin by stimulating the nerve endings of the sympathetic system. Chemically ephedrine (in the 3% solution put up by Lilly Co.) is closely related to adrenalin and both are levorotatory. However, in the eye as far as my experience goes—there is a marked difference between these two substances. Adrenalin ($\frac{1}{1000}$ solution) instilled in the conjunctival sac of normal individuals does not affect the pupils. It dilates the pupil in glaucoma (the Knapp test), in insufficiency of the pancreas, in some cases of Basedow and in patients with Horner syndrome. On the other hand, the ephedrine 1% solution dilates the pupils of normal individuals, but does not blanch the conjunctiva. As a hemostatic, 1% solution of ephedrine, is about equal to $\frac{1}{1000}$ sol. of adrenalin. Here also it differs by its slower, but more prolonged action.

I consider ephedrine as a valuable addition to our methods of producing mydriasis. Its therapeutic possibilities, as well as its physiologic and pharmacologic properties, are still a virgin field, ready to be exploited by willing minds.

TWO SAFETY MEASURES IN CATARACT EXTRACTION.[1]

By Dr. WALTER S. ATKINSON, Watertown, N. Y.

THE two measures selected for consideration are paralysis of the obicularis, and closing of the wound with a suture or sutures.

A forcible contraction of the orbicularis is probably the most common cause of loss of vitreous in cataract extraction. While a loss of vitreous is more or less expected in subluxated and dislocated cataracts, still a sudden contraction of the lid musculature in such cases adds greatly to the seriousness of it. To prevent this, various mechanical measures have been used, all of which are far from being infallible and offer many inconveniences.

Methods of infiltration with novocain, and similar drugs, to block the impulses along the branches of the facial nerve, which supply the orbicularis, were advanced by Van Lint (1), and Villard (2), the principles being essentially the same.

The method has been practiced by many operators who have reported very favorably on the procedure and, while pretty generally used, still many operators for one reason or another do not employ it.

It is not my purpose to offer a new method but simply to support the principle.

Wright (3), in 1921, reported the routine use of this procedure with very satisfactory results. Wright (4) later reported blocking of the facial nerve at its point of exit from the stylomastoid foramen, but the occasional persistence of the paresis or paralysis for several months rather deters us from such a procedure in this country.

[1] Read at the Annual Meeting of the Medical Society of the State of New York, at Niagara Falls, May 11, 1927.

Derby (5) in 1923 reported that he had adopted the infiltration with novocain for paralyzing the orbicularis as a routine.

Robinson (6) called attention to the fact that the musculture varied in different patients and that the corrugator supercilii and the angular head of the quadratus labii superior-ius, acting in an accessory manner, caused forceful closure of the lids after the method of injection advocated by Van Lint and Villard, had been used, suggesting also infiltrating from the supraorbital notch to the inner canthal ligament, following the contour of the bone, and another beginning at the infraorbital foramen and extending to the inner canthal ligament. In many patients this is not necessary but the aim should be to sufficiently paralyze the musculature of the lids so that the patient is unable to close them, whether one particular method or a combination of different methods be used to accomplish this result. When the lids are flaccid and partially opened, if the patient is asked to close his eyes as tightly as he can and the lids remain open and flaccid, or if one holds the lids open and the patient on being told to close as tightly as possible and no muscular contraction is felt, then one can proceed safely with the operation. This seems to be the safer indication to follow rather than using one method of infiltration and at the expiration of a certain time limit beginning the operation. Infiltration of the lids should, of course, be avoided. Some operators have said that they desire only a partial paralysis or a paresis of the lid musculature, but there seems to be no justifiable reason for such a desire. The more complete the paralysis the more desirable it is. The objection raised that with a complete paralysis the lids will not remain closed under the dressing is more fanciful than real. Operators using a complete paralysis experience little difficulty in this respect.

Smith (7) states in regard to paralyzing the lid musculature with novocain; "it does away with the reflex contraction and reduces the muscle tone so that the lids tend to lie open, but the motor nerves are unaffected and the muscle remains under the control of will." He does not state what method of infiltration or blocking he used but certainly this has not been the experience of many operators using this procedure.

Two per cent novocain, with one or two drops of adrenalin to 10*cc* seems to be about the strength used by most operators.

Some feel that it is safer to use one per cent novocain but a longer time is required before the paralysis is produced and very often it is not so complete. When one considers that the general surgeon uses 200 to 300*cc* of ½% novocain in the average case without ill effects, surely 6 or 8*cc* of 2% novocain is well within the realm of safety. Labat (8) gives 30*cc* as the amount of 2% novocain that can be used with safety on the average patient.

In fifty consecutive cases of combined extraction of cataract, some in capsule, where paralysis of the musculature was obtained by infiltration with novocain before beginning the operation, no vitreous presented except in two cases of loop delivery in subluxated cataracts, one with adhesions of the iris below. In these cases vitreous was expected but by drawing the wound closed with a suture which had already been introduced a loss of vitreous was prevented in one and in the other a small amount was lost. The visual results being $\frac{10}{15}$ and $\frac{10}{10}$, while forcible contraction of the lid musculature in these cases might have been disastrous. In another of this series the cataract was dislocated into the anterior chamber with secondary glaucoma, and was removed without vitreous presenting.

It is realized that with such a small number of cases one cannot draw very definite conclusions as to the desirability of the procedure. Still they help to demonstrate that in uncomplicated cataracts the loss of vitreous from squeezing is eliminated and also that a dangerous loss of vitreous is avoided in subluxated and dislocated cataracts.

The actual time from the beginning of the injection until the paralysis was accomplished was kept. The average time required for 1% novocain with adrenalin was 13.6 min. and with 2% novocain and adrenalin was 6.66 min. In a few paralysis occurred as soon as two and a half minutes. Each operator seems to vary the technic of injection somewhat to suit his individual characteristics, and provided the desired result is achieved without risk or undue discomfort to the patient, it matters very little what procedure he uses, but if a Labat syringe is used and a small wheal first raised with a No. 1 wheal needle, followed by the use of a No. 2 needle (5*cm* long) and injected slowly as the needle is introduced, one attains the desired result with the minimum amount of risk and dis-

comfort. If the wheal is raised at about the center of the external orbital margin, the first injection made up the length of the No. 2 needle following the line of the external orbital margin and keeping as close to the bone as possible, then a similar injection down following the line of the external orbital margin, using about *2cc* for each injection and necessitating only one puncture with the needle, the desired result is usually obtained. However, if not, further injection can be made along the orbital margin as suggested by Robinson. If after about ten minutes has elapsed with the paralysis not yet complete and not increasing, then further injections should be made at right angles to the course of the nerve supply to the orbicularis. While this is rarely necessary, still there is no particular objection to it, except that it requires a little more time.

The fact that the course of the nerves supplying the orbicularis varies in different individuals, as does also the musculature, seem logical reasons for not depending upon any one method of infiltration if a complete paralysis is desired.

The reason cases are recorded where the paralysis is incomplete or unsuccessful is probably due to the fact that a certain method is used as a routine, being done in many instances by an assistant and at the expiration of the usual time the operation is begun. Some surgeons even begin the operation directly the injections have been made, which is obviously wrong.

If the injections are properly placed so that infiltration takes place around all the branches supplying the orbicularis, complete paralysis will be quickly and surely obtained.

Pressure over the site of infiltration seems to accelerate the action of the novocain. A cup of coffee before the operation is neither considered necessary nor always advisable, still patients who have been operated with and without coffee express their preference for the coffee.

To be able to eliminate the phrase "don't squeeze" from one's vocabulary during cataract extraction and to know that the patient cannot squeeze is a wonderful relief to the operator as well as greatly increasing the percentage of successful operations with good vision.

The second measure to be considered is the suturing of the wound.

Various methods have been advanced by operators from nearly every quarter of the globe, and these different methods have been reviewed from time to time in the literature, so to avoid repetition and as a review here seems rather unnecessary, it will be omitted.

Again the object is to support the principle rather than to advance a new way of closing the wound with sutures.

The fact that so many operators have advanced different methods of suturing the wound indicates first, the desire to be able to close the wound quickly and securely, and second, a difference in the personal equation of the operators.

That a conjunctival flap covering as much of the wound as possible is desirable seems to be generally admitted, and although conjunctival sutures are said not to hold the wound so firmly closed as the corneo-scleral suture, still they can be tight enough to wrinkle the cornea, which, of course, is too tight, and they will hold the wound firmly for a day or two which is usually sufficient.

Whether the suture or sutures are introduced before or after the section, has given rise to some controversy, there being good reasons on both sides, but paralyzing the musculature of the lids seems to eliminate many of the objections to introducing the suture after the section, except where corneal or scleral sutures are used. These, of course, should be introdued before the section.

The objection to the Kalt (9) suture is that the wound is not covered by a conjunctival flap.

A modification by Verhoeff (10) of the Kalt suture, and later a modification of this, indicates his desire for a larger conjunctival flap.

To complete the section with a large conjunctival flap before introducing the sutures has the advantage of being easily and quickly done and with very little trauma. Then, provided the lid musculature has been paralyzed, little difficulty is experienced in introducing one central suture, the loops of which can be placed to either side out of the way, and the cataract extracted, the suture tied and two more introduced. With sutures placed nasally and temporally, if a good bite of the conjunctiva is taken, the wound at both angles can be closed very tightly at locations where iris prolapse are most likely

to occur following combined extractions. The removal of the sutures need not cause uneasiness. If 00 silk is used they very often come out themselves by the 4th or 5th day and if not the irritation from such small sutures is slight, but they can be removed very easily and safely if just scissors without forceps are used, as suggested by Ziegler. This method of suturing the wound has proved to be the most satisfactory for me in the average case, but when the cataract is dislocated or subluxated, I prefer having the flap prepared and the suture in place before making the section.

With Berens' (11) untied suture, some raise the objection that the loops of the suture get in the way during the extraction of the cataract, but there need be only two, one on either side, and if the silk is wet they will lie flat and out of the way. Certainly the advantages greatly counterbalance the objections.

If some method of suturing is used where the suture is introduced before the cataract is extracted, the advantage of being able at any time to close the wound quickly and easily are so evident and so outweigh the disadvantages, that to consider them separately seems unnecessary. A needle holder without a catch adds greatly to the safety and ease with which sutures can be introduced, also a very fine sharp corneal needle, 14*mm* long, with an easy curve makes the introduction much easier.

The forceps tying of sutures simplifies and facilitates the procedure, as well as being an added protection against infection.

A very simple way to tie with forceps is to grasp the lower end of the suture with tissue forceps held in the left hand, a turn of the suture is made around the end of the needle holder which is held in the right hand and the upper end of the suture is grasped with the needle holder and drawn through the loop made by taking this turn. The first of the tie is in this way made and the loops of the suture placed to either side out of the way. When the wound is closed and the first tie is drawn tight, a second one is made in the same manner. In completing the knot, it is desirable to use tissue forceps in tead of the needle holder. The fine 00 silk used in suturing often slips through ordinary tissue forceps unless the silk is grasped at right angles to the serrations on the tips of the forceps.

This is most unsatisfactory and annoying but if tissue forceps, with a groove on one arm of the biting surface of the forceps and a ridge on the other arm that fits into the groove, are used, the finest silk may be grasped at any angle and will not slip.

Summary.

Paralysis of the orbicularis in cataract extraction by infiltration with novocain to block the branches of the seventh nerve supplying this muscle is safe, easily produced, and makes the operation much simpler.

The object should be to get complete paralysis of the orbicularis and one should not confine himself to any one method of infiltration to obtain this end.

In uncomplicated cataracts it eliminates the most common cause of loss of vitreous.

It also helps to prevent serious loss of vitreous is dislocated and subluxated cataracts.

With the lids temporally paralyzed the introduction of a suture is made much easier.

Closing the wound with sutures is desirable and the advantages are many as compared with the disadvantages.

Sutures placed nasally and temporally help to prevent prolapse of iris.

A needle holder without catch, fine sharp needles, with oo silk, and forceps for tying that do not allow the silk to slip, add to the ease and safety of the procedure.

BIBLIOGRAPHY.

1. Van Lint. "Paralysie palpébrale temporaire provoquée dans l'opération de la cataracte." *Ann. d'ocul., par.*, 1914, vol. cli, pp. 420–4.
2. Villard, H. "Paralysie temporaire des paupières dans l'opèration de la cataracte." *Ann. d'ocul., par.*, 1919, vol. clvi, pp. 352–364.
3. Wright, Major R. E. "Blocking of the facial nerve in cataract operations." *American Journal of Ophth.*, 1921, vol. iv, pp. 445–446.
4. Wright, Major R. E. "Blocking of the main trunk of the facial nerve in cataract operations, based on experience of over 150 cases." *Arch. of Ophth.*, vol. lv, No. 6, 1926.
5. Derby, Geo. S. "Modern aids to cataract extraction." *Transactions of Section on Ophth., A.M.A.*, 1923.

6. ROBINSON, J. MATHEWS. "Some observations on blocking of the fifth and seventh nerves as an accessory in cataract operations." *Arch. Ophth.*, vol. lvi, No. 2.
7. SMITH, LT. COL. HENRY. "The treatment of the iris in cataract operations. *Arch. Ophth.*, vol. lvi, No. 2."
8. LABAT, GASTON. *Regional Anesthesia.*
9. KALT, E. S. "Suture de la cornée." *Arch. d'ophth.*, 14: 639, 1894.
10. VERHOEFF, F. E. "Corneoconjunctival Suture for Cataract Operations." *Arch. of Ophth.*, vol. lvi, No. 2.
11. BERENS, CONRAD. "The united suture in cataract extraction." *Trans. Ophth. Section, A. M.A.*, 1925.

TEST CARDS FOR THE DETERMINATION OF THE VISUAL ACUITY. A REVIEW.

By Dr. ALFRED COWAN, Philadelphia.

(With five illustrations in the text.)

THE literature bearing directly and indirectly on the subject of test cards for the determination of visual acuity is so profuse that merely a list of the titles would be immense; but there is so much repetition, so many tests proposed that are only copies or slight modifications of what has already been published, and there are so many articles that are only arguments for or against certain tests, that, for the purpose of this paper, a complete bibliography is considered both tiresome and unnecessary. Nor does space permit a discussion of the illumination of test cards, or of the psychic and other factors that affect the result of a visual acuity test.

In 1610 Johannes Kepler, in the "Dioptrics of the Eye," gave the first mathematical explanation of the path of light in the eye and the formation of retinal images; but probably before Kepler, Felix Plater (1536–1614) showed that the "Chrystal" of the eye formed images on the retina. Scheiner proved that the retinal image is inverted (1).

Robert Hooke (2) was the first to investigate the physiological value of the acuteness of vision. He found that among a hundred persons scarcely one could distinguish a double star as such when the distance between the stars subtended an angle at the eye of less than one minute. Since then numerous workers have carried out similar investigations, and Helmholtz (3) gives a complete bibliography on the subject of visual acuity up to his own time. He experimented with gratings of black wire, and his findings were nearly the same as those of Hooke.

The smallest angle of visual acuity varies, according to different investigators from Hooke to those of the present time, from 45 to 95 seconds; but it is generally agreed that, for convenience, the average normal may be assumed to be one minute. This angle, which subtends the smallest distance between two objects at which they can just barely be distinguished as two, is the "angle of distinctness" or "minimum visibile," and it measures the resolving power of the eye. The visual acuity of an eye is inversely proportional to its resolving power (4, 6).

The diameter of the retinal cones in the region of the fovea varies, according to different writers, from .0015 millimeter to .0036 millimeter (5), and the size of the retinal image of an object that subtends an angle of one minute at an emmetropic eye is about .004 millimeter. It is generally believed, therefore, that there is a direct physiological relationship between the size of the image and the diameter of a foveal retinal cone; and that two points can be seen as separate points only when the image is larger than a retinal cone, that is, the image must be large enough to cover one cone and reach onto the adjacent cones on opposite sides.

But the most sensitive portion of the retina is in the center of the fovea and it is here, as Southall (6) has said, that the resemblance between the retina and a photographic plate ceases, because a photographic plate is equally sensitive all over, while the sensitiveness of the retina rapidly decreases toward the periphery. Aubert and Förster (7) found that the acuteness of vision is nearly the inverse of the angle of deviation between 12 degrees and 20 degrees, and the diminution is even more rapid beyond 20 degrees.

Donders (8) assumed that "the acuteness of vision is inversely proportional to the number of percipient retinal elements which are required, in a linear dimension, to the distinguishing of the image." That is, an image having double the magnitude has not at the same time double the distinctness. Thus, since a larger image must necessarily impinge on elements not so sensitive as those that would be covered by a very small image, it is the smallest distinguishable image which is the most distinct. Except for the spot fixed all other parts of even small objects are seen indirectly. The eye, in order to

obtain clear vision, surveys an object by rapidly fixing on one spot after another. Tscherning (9) says that in order "To judge of the form of objects we grope for them, so to speak, with the look."

The acuteness of vision of different individuals is obtained and compared by determining the smallest angle under which they are able to recognize objects of known form in an illumination of average intensity (10). In an attempt to determine the comparative acuity of vision for clinical purposes, Jaeger (11), in 1854, published a wall chart containing a series of graded figures, although test cards on a less elaborate scale had already been adopted by Carion (12), Smee (13), Giraud-Teulon (14), and others.

The first system of test objects, so arranged that the acuteness of vision could be expressed by a number, was proposed by Snellen (15) in 1862. These test objects, or "optotypi" as Snellen called them, consist of square letters and numerals with block serifs, each stroke subtending an angle of one minute while the entire character is contained in an angle of five minutes at the eye.

The original Snellen test characters were arranged in a graduated scale of sizes for distances of 10, 15, 20, 30, 40, 50, 70, 100 and 200 feet. Later (16) Snellen designated 3, 5, 6, 9, 12, 18, 22, 30 and 60 meters to agree, as nearly as possible in round numbers, with the distances in feet. Each character is marked with the number that properly indicates the distance at which it subtends an angle of five minutes and, therefore, distinguishable by the average normal eye.

Green (17) objected that the graduations in the size of the Snellen types give the very unequal series of ratios of 1–2, 7–10, 5–7, 4–5, 3–4 and 2–3. He proposed a series of 24 numbers bearing the constant ratio of

$$\sqrt[24]{0.5} = .7937$$

(nearly .8) in decreasing progression; thus combining the advantage of regular geometric progression with all the important numbers of Snellen. The advantage of Green's gradation in geometric progression is generally recognized.

The Ives (18) instrument for testing visual acuity is designed to give a continuous change in the size of the object.

Thorington (19) constructed a letter V which can be mechanically varied in size. Gradual change in the size of the object is accomplished in the Clason Visual Acuity Meter by imaging the test object on a screen; Ricci (20) has devised an instrument based on the same principle. Downey (21) arranged a test object which is moved along a board by a string. Proksch (22) uses a card along the whole length of which are drawn three converging solid lines with an interval of the same width, the lines being exposed through a horizontal slit of adjustable size.

By the Snellen notation the visual acuity is expressed by a fraction having the distance of the object, d, for its numerator and the size of the test character, D, for its denominator; that is,

$$V = \frac{d}{D}$$

in which V signifies the acuity of vision. If the patient sits at a distance of 20 feet from the card and reads type marked 20, which type subtends an angle of 5 minutes at this distance, the visual acuity is noted as $\frac{20}{20}$ or, if expressed in meters, $V = \frac{6}{6}$. In normal visual acuity, therefore,

$$d = D \text{ and } V = 1$$

The Committee on Compensation for Eye Injuries for the Section on Ophthalmology of the American Medical Association in 1925 (23) reported that "The ability to recognize letters which subtend an angle of 5 minutes, each unit part of which subtends a 1 minute angle, is accepted as a standard. Therefore a $\frac{20}{20}$ Snellen is employed as the maximum acuity of central vision, or 100 per cent acuity."

While $\frac{6}{6}$ Snellen is generally accepted as a fair general average for the normal visual acuity, it is by no means rare to find a much higher visual acuity in healthy young individuals. Johnson (24) cites a case of a Congo boy whose vision was $\frac{6}{1.5}$ or 4. Snellen (25) wrote that "$V = \frac{d}{D}$ is only strictly applicable so long as the same test-objects are made use of for determining the value of d, a fact that is at the present time far from being universally admitted. . . . The number of 'new' 'improved,' partly copied test-letters has

indeed reached a considerable amount," and the "Alterations —not always improvements—have again and again been recommended from all sides." And this was written over thirty years ago.

Monoyer (26) arranged types in which the differences could be expressed in tenths, at a distance of five meters, so that the visual acuity might be written in decimals of .1, .2, .3, and so forth. Blascovics (27) proposed a unit of measurement for the visual acuity which he calls an "oxyoptre." The oxyptre (/$_0$) is $\frac{1}{60}$ part of a Snellen unit—there being 60 minutes to one oxyoptre—and is the reciprocal value of the visual angle expressed in degrees. Normal vision (Snellen $\frac{6}{6}$) is equal to 60 oxyoptres; one oxyoptre would be expressed as V = $\frac{1}{60}$ Snellen. Vierordt (28) suggested that it might be better to express visual acuity as inversely proportional to the square of the surface of the image, and not the diameter—instead of V = $\frac{1}{2}$, $\frac{1}{4}$ and so forth, write V = $\frac{1}{4}$, $\frac{1}{16}$ and so forth. Weiss (29) uses intervals of $\frac{1}{10}$ so as to determine equal intervals of visual acuity, but prefers the formula $V = \frac{d}{D}$ for the reason, given by Snellen (25), that the numerator of the fraction indicates the distance at which the test is made.

In 1903 the Committee on Standard Test-types of the American Ophthalmological Society (30) recommended that the formula $V = \frac{d}{D}$ ought to be retained; the International Ophthalmological Congress at Naples in 1909 adopted the decimal notation of Monoyer and called it "international"; and the Committee on Compensation for Eye Injuries of the Section on Ophthalmology of the American Medical Association in 1925 (23) reported that "Visual acuity shall be measured both for distance and near, using Snellen notation. . . ." It seems that the majority of ophthalmologists prefer the Snellen notation and Green's gradation.

It is generally agreed that 15 feet or 5 meters is the minimum distance at which the accommodation does not materially affect the size of the retinal image, and the minimum at which the test for distant visual acuity should be made. In small rooms it is optically correct to increase the distance by the use of a plane mirror. Many ophthalmologists prefer this

arrangement for the reason that the card, when placed directly behind the patient, is within easy reach of the examiner. Test cards, for use with a mirror, are made with laterally inverted characters. Cohn (31) had letters printed on transparent paper to be hung against a window, and when turned to be used with a mirror. Pflüger's (32) Sehproben are symmetrical letters chosen from Snellen's original optotypi and may be used with or without a mirror; Tallman's (33) arrangement is similar to Pflüger's.

In order for a test letter to be scientifically correct it is necessary that not only the bar, stem and arm subtend an angle of one minute, but also that the space between them

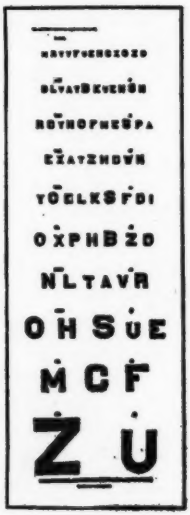


FIG. 1.

always subtend the same angle. Dennett (34) showed that the shortest line that can be drawn through very many parts of the letters subtends an angle of more than two minutes. He pointed out that T, U and V can be seen half as far again as B and S, and gives a chart of the 26 letters of the alphabet and their sizes as seen by the normal eye at five meters.

Test cards, for office use, have been published after the principle of Dennett.

Green, in 1868, stated that any series, however limited, may be divided into letters of easier and of more difficult recognition. He rejected A, B, K, M, N, R, S, V, W, X, Y, and Z as undesirable test letters.

The Committee on Standardizing Test Cards for Visual Acuity for the Section on Ophthalmology of the American Medical Association in 1916 (35) shows, in a table of values for the different letters, that L is the easiest and B the hardest to recognize. They chose L, Y, G, N, V, O, E, S, U, C, P, R, T, D, H, B, F, and Z as most suitable for a test card, because the other letters could not be made to meet the one minute-five minute requirement without distortion that would interfere with their recognition.

Hartridge and Owen (36) recommend that the letters D, F, H, N, P, T, U, X, Y, and Z be used, as it was proved by their experiments that these letters were recognized without error about the same number of times.

Thorington (37) eliminates B, S, R, K, G, and Q for various reasons. Oliver (38) used only C, D, E, F, L, O, and T and gives no reason. Hay (39) chose A, C, E, H, L, N, O and T because they were easiest. Banister (40) believes that C, D, G, O, Q and H, K, M, N, W are most suitable as test letters because they are mistaken one for the other. Landolt (41) says that, according to the principle laid down by Snellen, G may be distinguished from O and F from E but that the principle is not applicable to the other letters of his series.

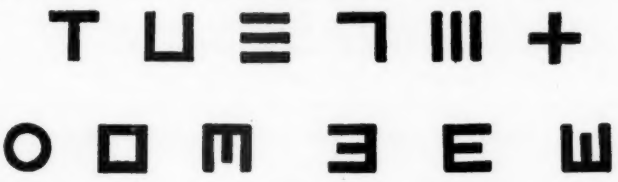


FIG. 2.

The letters of Snellen are block capitals with serifs which are the same in length and width as the thickness of the arm of the letter. Green's first series consisted of non-serf block

letters, known as Gothic or Antique. In his series of 1872 (43), and in all subsequent series, Green used a block letter in which the serifs show a uniform extension of a half square, instead of a square, beyond the limbs of the letters. Monoyer adopted a specially designed non-serif letter.

The Committee on Standardizing Test Cards for the Section on Ophthalmology of the American Medical Association in 1916 (35) considered type similar to the original Snellen letter with serifs, and suggested the following sample card of block letters:

Five Minute Distance Meters		*Vision if Half are read*	*Vision if All are read*
50	B	....	0.1
25	U H	....	0.2
16.67	T Z S	....	0.3
12.5	L Y N B	....	0.4
10	V D Z R G	....	0.5
8.33	C F N E S H	....	0.6
6.25	T U Y O R Z G S	0.7	0.8
5	V C D F E N S P	0.9	1.
4.17	L U O Y Z E S G	1.1	1.2
3.57	U T D P Z R B H	1.3	1.4
3.12	T L Y P N E H S	1.5	1.6

The same committee, in its third report (44), gave the results obtained by comparing 18 Gothic (non-serif) letters. The values were for the same letters as those in their second report except that A, K and X replaced G, U and Y in the group of 18 letters. The findings were, in many instances, different from those of their previous report, although L was still the easiest and B the hardest to distinguish. They suggested two more sample test cards of block letters. No direct comparison was made between Gothic and block letters.

Gothic letters are more easily distinguished than either the block letters of Snellen or those of Green. Even the Gothic letters constructed to subtend an angle of 4 minutes, such as those of Wallace or of Thorington, are often more easily seen than the 5 minute letters with serifs. Nonserif

letters and serif letters of the same size are unequal tests of visual acuity.

In 1862 Snellen (45) had letters printed in black on white, and in white on black, Gould (46) had cards with white letters on a black ground, not knowing it had been done before, and claimed that they were less tiresome to the eyes. Snellen (47) also used colored letters on black, on white and on gray ground. Thorington (37) used yellow letters on a black ground. Hay (39) had types in green, yellow and red.

Streidinger (48) introduced a test consisting of sets of dots with the distance at which they should be counted. This is the simplest test for visual acuity. Boettcher (49) arranged a series of square and oblong figures, and noted the distance at which they were to be seen and counted by a normal eye.

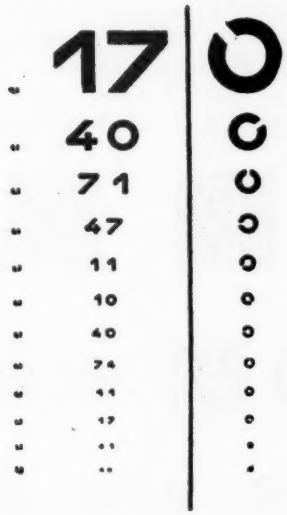


FIG. 3.

Snellen used the square, circle, cross, parallel lines, broken square and his letter E—without serifs—turned in four directions. A figure, that would result if the bar of the E were removed, was used by de Wecker (50), later by Steiger (51), and again by Oliver (52)—nothing more than the broken square

that Snellen had already used in his series of figures for illiterates. Landolt (53) proposed that the vision be tested by means of a black ring on a white ground; the ring to be broken at one part for a space equal to the width of the limb which is one-fifth of the diameter of the ring. The International Ophthalmological Congress in Naples in 1909 adopted Landolt's "broken ring" as a standard test object. Guillery (54) recommended, as the simplest means of determining the acuity of vision, a series of disks of different sizes, each arranged in a separate square, the requirement of the test being that the patient has to mention in what part of the square the disk lies. Jackson (55) proposed as a test object a figure similar to that of de Wecker, but differing in that the space between the two arms subtends an angle of 1 minute, making the whole figure subtend an angle of 3 minutes. This figure conforms to the physiological requirements of a test object while the broken square does not. Ewing (56) suggested what he called a "uniform visual test object," which consists of a 1 minute break in the central line of the

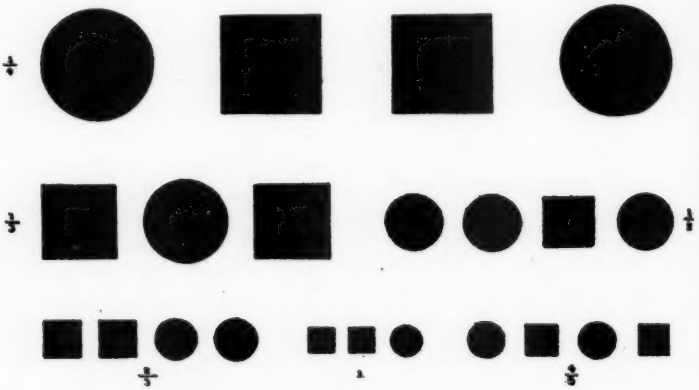


FIG. 4.

3 line 1 and 5 minute test of Snellen; this to be arranged with other 3 line 1 and 5 minute groups, the test being to select from the several groups the group containing the 1 minute break. Dor (57) described what he considers a "universal

optometric scale" which consists of circles and squares both having the same area, arranged in groups, the patient being required to tell the number of circles and squares in each.

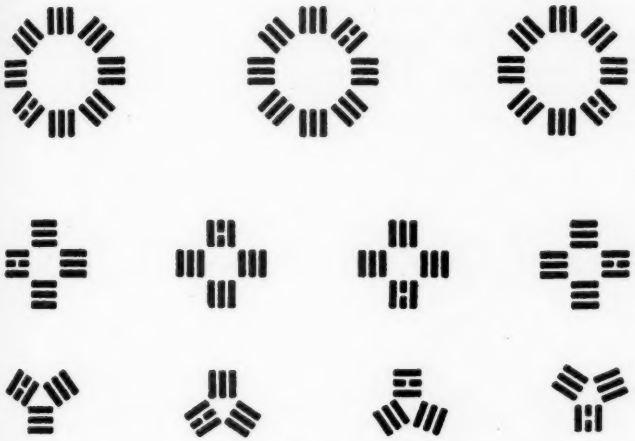


FIG. 5.

These are only a few of the many illiterate test objects—not to mention the picture cards of Albini, Wolfberg and others—that have been proposed from time to time since 300 B. C. (58).

Such test objects as the "broken ring" of Landolt and the figure of Ewing are, to a certain extent, open to the same objections as those which Snellen (25) offered to the test of Guillery; that is, that it is a photometric test, not a test of visual acuity, because it is the brightness and not the shape that has here to be considered. The disk may be indefinitely small if the light is sufficiently strong.

Young (59) noted that a minute point assumes the shape of a star when beyond the farthest focal distance, and Donders (60) says: "To illuminated points on a dark ground there are scarcely boundaries. Small as such a point may be, its image has, on account of the imperfection of the dioptric system of the eye, a certain extent; and the question is now only whether this produces, on one or more percipient retinal elements, a

difference of illumination from the others, sufficient to be distinguished. . . The question as to the smallest angle under which any object is still to be seen, is thus governed completely by the degree of illumination, and in a physiological point of view it has therefore no meaning." In the words of Landolt (42): "The determination of the acuteness of vision consists, therefore, in the determination of the smallest retinal image the form of which can be distinguished." But the patient is not asked to distinguish the form of the break in Landolt's ring, he is required merely to give its location; and this is true in all tests of this kind. Tests such as that of Dor, which consists of circles and squares, and in which the patient must distinguish the one from the other, seem to be more conformable to the physiological requirements of a test of the visual acuity.

If, as is generally agreed, letters of the alphabet are not ideal objects for testing the visual acuity, neither is there any so-called universal test object which can adequately take their place for practical and clinical sight testing. On the other hand, the numerous attempts to improve or modify the 1 minute block letter of Snellen has led to nothing but confusion. At the present time the variations in the test cards by different authors and by different publishers is such that the designation of the card used should be incorporated in the notation of the visual acuity. The Committee on Standardizing Test Cards for the Section on Ophthalmology of the American Medical Association in 1915 (61) found that the 32 test cards examined varied so greatly in the style, proportion and size of the letter employed; in the character of the imprint; and in the character of the background furnished by the cardboard, that they considered the confusion intolerable. The confusion still exists.

Test cards, with the arrangement of block letters suggested by the Committee on Standardizing Test Cards (35, 44), graded according to the geometric proportion of Green, with proper spacing of the letters in each line, and printed in black on selected white cardboard, should be standardized. It does not seem desirable for individual ophthalmologists to have their own cards made, but that they should be published by a reliable firm, under the direction of a national committee.

REFERENCES.

1. J. HIRSCHBERG. "Geschichte der Augenh." *Gräfe-Sämisch's Handbuch der Augenheilkunde*, 2nd Ed., Bd. xiii, pp. 294–310.
2. ROBERT HOOKE. Posthumous Works, 1705. Robert Smith's *System of Compleat Opticks*, Cambridge. 1738, vol. i, b. 1, ch. 3.
3. HELMHOLTZ'S *Treatise on Physiological Optics.* Trans. by J. P. C. Southall. Menasha, 1924, vol. ii, pp. 33–36, 45–46.
4. HELMHOLTZ. *Ibid.*, vol. i, p. 367, vol. ii, pp. 32–34.
5. F. W. ELDRIDGE-GREEN. *Physiology of Vision.* London, 1920, p. 9.
6. J. P. C. SOUTHALL. "Refraction and Visual Acuity of the Human Eye." *Am. Jour. Phys. Optics*, 1920, vol. i, p. 277.
7. AUBERT and FÖRSTER. "Untersuchungen über den Raumsinn der Retina." *Gräfe Arch. f. Ophth.*, vol. iii, Abt. 2, p. 1.
8. F. C. DONDERS. *Anomalies of Refraction and Accommodation of the Eye.* Trans. by W. D. Moore, London, 1864, p. 194.
9. M. TSCHERNING. *Physiologic Optics.* Trans. by C. Weiland, 3rd Ed., Phila., 1920, p. 334.
10. F. C. DONDERS. *An Essay on the Nature and Consequences of Anomalies of Refraction.* Ed. by C. A. Oliver, Phila., 1899, p. 30.
11. E. JAEGAR. *Ueber Staar und Staaroperationen.* Wien, 1854. *Schrift-Scalen* (German, English, and French). Wein, 1860.
12. STELLWAG CARION. "Die Accommodationsfehler des Auges," in *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Mathem. naturw. Klasse.* B. xvi, p. 187.
13. A. SMEE. *The Eye in Health and Disease.* London, 1854, p. 70.
14. M. L. F. GIRAUD-TEULON. *Instruction pour l'Emploi de l'Echelle, etc.*, Paris.
15. H. SNELLEN. *Letterproeven ter bepaling der gezigtsscherpte.* Utrecht, 1862. *Probebuchstaben zur Bestimmung der Sehschärfe.* Utrecht, 1862.
16. H. SNELLEN. *Optotypi ad visum determinandum.* Ed. 5, Metrico systemate. Traj. ad. Rhenum, 1875.
17. J. GREEN. *Recent Advances in Ophthalmic Science*, by H. W. Williams, Boston, 1862. "On a New Series of Test Letters, etc." *Trans. Am. Ophth. Soc.* 1868, p. 68.
18. H. E. IVES. "A Visual Acuity Test Object." *Electrical World*, 1910, lv, p. 939.
19. J. M. THORINGTON. "A Variable Test Letter." *Am. Jour. Ophth.*, 1923, vol. vi, p. 361.
20. E. RICCI. "Decimal Notation of Luminosity." *Ann. di ottal.*, 1923, vol. lii, p. 965.
21. DOWNEY. *Am. Jour. Ophth.*, 1924, vol. vii, p. 396.
22. PROKSCH. "Apparat zur Kontinuierlichen Bestimmung der Sehschärfe." *Klin. M. f. Augenh.*, 1923, 2, p. 241.
23. *Presessional Volume*, Sec. Ophth. Am. Med. Ass., 1925, p. 329.
24. G. L. JOHNSTON. *Pocket Atlas and Text-Book of the Fundus Oculi.* Chicago. Description of Fig. 4, Pl. 2.

25. H. SNELLEN. *System of Diseases of the Eye.* Ed. W. F. Norris and C. A. Oliver. Phila., 1897. vol. ii, p. 11. "Notes on Vision and Retinal Perception." The Bowman Lecture, 1896. *Trans. Ophth. Soc. U. K.*, vol. xvi, p. 1.
26. H. MONOYER. *Echelle typographic decimale*, 1877.
27. L. BLASCOVICS. "New Unit of Visual Acuity and its Practical Use." *Arch. of Ophth.*, 1924, vol. liii, p. 476.
28. K. VIERORDT. "Ueber die Messung der Sehschärfe." *Arch. f. Ophth.*, vol. ix, 1, p. 161, and ix, 3, p. 219.
29. L. WEISS. *Sehproben-Tafeln zur Bestimmung der Sehschärfe für die Ferne.* Heidelberg, 1895.
30. "Report of the Committee on Standard Test-Types, and on Reading Tests." *Trans. Am. Ophth. Soc.*, 1903, vol. x, p. 189.
31. H. COHN. *Transparente Seh-Proben.* Wien, 1894.
32. E. PFLÜGER. *Optotypi* (*Sehproben*). Bern, 1884. *Sehproben und Sehprüfung* (*Optotypi Pflüger*). Basel u. Leipsic, 1896.
33. M. H. TALLMAN. "Test Chart Usable with or without Mirror." *Arch. of Optometry*, 1922, vol. i, p. 26.
34. W. S. DENNETT. "Test Type." *Trans. Am. Ophth. Soc.*, 1885–86, vol. iv, p. 133. "A New Test Type." *Trans. Am. Ophth. Soc.*, 1886–87, p. 245.
35. *Trans. Sec. Ophth. Am. Med. Ass.*, 1916, p. 383.
36. H. HARTRIDGE and H. B. OWEN "Test Types." *Brit. Jour. Ophth.*, 1922, vol. vi, p. 543.
37. J. M. THORINGTON. "New Test Card." *Am. Jour. Ophth.*, 1921, vol. iv, p. 740.
38. C. A. OLIVER. "New Series of Metric Test Letters." *Trans. Am. Ophth. Soc.*, 1885, p. 130, 1886, p. 215. "A New Series of Test-Type." *Arch. of Ophth.*, 1893, vol. xxii, p. 200. "A Perfected Series of Test-Type." *International Med. Mag.*, July, 1897.
39. P. J. HAY. *Trans. Ophth. Soc. U. K.*, vol. xxxix, 1919, p. 240.
40. H. BANISTER. "Block Capital Letters as Tests of Visual Acuity." *Brit. Journ. Ophth.*, 1927, vol. xi, p. 49.
41. E. LANDOLT. *A Manual of Examination of the Eyes.* Trans. by S. M. Burnett, Phila., 1879, p. 149.
42. E. LANDOLT. *Ibid.*, p. 146.
43. J. GREEN. "On Some Improvements in Test Letters." *Rep. Internat. Ophth. Cong. 1872*, London, 1873, vol. iv, p. 153.
44. *Trans. Sec. on Ophth. Am. Med. Ass.*, 1917, p. 347.
45. SNELLEN'S *Optotypes*, 2nd Ed. (1862). Printed for the Army Medical School in England.
46. G. M. GOULD. "Test Cards with Black Background and White Letters." *Ann. Ophth.*, St. Louis, 1897, vol. vi, p. 4.
47. H. SNELLEN. *Optotypi ad visum determinandum.* Edinburgh, Paris, New York, Berlin and Utrecht.
48. T. LONGMORE. "Notes on the Examination of the Visual Fitness of Recruits for Military Service." *Army Medical Reports*, 1860, London, p. 462.

49. BOETTCHER. *Geometrische Sehproben zur Bestimmung der Sehschärfe.* Berlin, 1870.
50. L. DE WECKER. *Echelle métrique pour mesurer l'acuité visuelle.* Paris, 1877.
51. A. STEIGER. *Einheitliche Sehproben zur untersuchung der Sehschärfe in der Ferne und in der Nähe.* Bern, 1892.
52. C. A. OLIVER. "Test Card for the Illiterate." *Ophthalmic Record,* Nov., 1907, p. 537.
53. E. LANDOLT. "Tableau d'optotypes pour la determination de l'acuité visuelle." *Soc. Français d'opht.,* 1889, p. 157. "Nouveaux opto-types pour la determination de l'acuite visuelle." *Arch. d'opht.,* 1899, vol. xix, p. 465.
54. GUILLERY. *Sehproben zur Bestimmung der Sehschärfe.* Stabarzt in Köln, 1891.
55. E. JACKSON. "Tests for Visual Acuteness." *Jour. Am. Med. Ass.,* 1891, vol. xvi, p. 157.
56. A. E. EWING. "A Uniform Visual Test Object." *Trans. Am. Ophth. Soc.,* 1916, p. 566.
57. L. DOR. "Echelle optométrique universelle." *Rev. Gén. d'Opht.,* 1920, vol. xxxiv, p. 317.
58. A. E. EWING. "Test Objects for the Illiterate." *Am. Jour. Ophth.,* 1920, vol. iii, p. 5.
59. THOMAS YOUNG. "Philosoph. Trans. for 1801." *Misc. Works of the Late Thomas Young.* Ed. by Geo. Peacock, London, 1885, vol. i, p. 49.
60. F. C. DONDERS. "Anomalies." *Ibid.,* p. 195.
61. *Trans. Sec. Ophth. Am. Med. Ass.,* 1915, pp. 242–255.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. H. DICKINSON.

An ordinary meeting of the Section took place on January 13th, the President, Mr. Ernest Clarke, C.V.O., F.R.C.S., occupying the chair.

Clinical Cases.

Miss M. Dobson showed a case of **Bilateral Papillœdema due to Cerebral Tumor.**

The patient was a woman aged 42, and her occupation that of clerk. In August, 1927, her left breast was removed for malignant disease in a hospital. Shortly after that operation she began to suffer from deafness and persistent headache the pain extending to the neck. Until this time her eyesight had been normal, but on November 10th last she suddenly became totally blind, though she only remained so for a few moments. Since that date there had been a gradual deterioration of vision. At present the headache was mainly frontal; she had exacerbations, with sickness, several times a week. There was no paralysis of extra-ocular muscles; the pupils were semi-dilated, and only accommodated to a strong light. The optic nerve head was found to be very œdematous, and the veins of the fundus were much distended. The macular region was œdematous, and the fovea showed white spots of exudation and there were spots tracking towards the temporal side of the disk, while the macular area was thrown into folds, with striate hemorrhages in between. The fellow eye was much the same. There were no localizing symptoms. The exhibitor thought

it very likely that the cerebral tumor was malignant, in which case she asked whether trephining to relieve the headache or to restore some sight was desirable.

MR. HARRISON BUTLER thought the results of operation for removing cerebral tumors by ordinary surgeons were usually tragic, and as this tumor was probably malignant, it did not seem justifiable to operate merely to relieve sight, though something operative might be done to relieve pain.

MR. G. W. KENDALL showed a case of **Tumor in the Anterior Chamber, with Recurrent Hyphæma.**

When he saw the case there was considerable hemorrhage into the anterior chamber. The tumor was anterior to the iris, and was vascular-looking; beneath it was a posterior synechia. After the hemorrhage had been absorbed, the disk could be seen to be cupped and atrophic. It seemed to be a solid tumor, and had remained the same for a very long time; the patient said he had had a red spot on his eye for forty years.

MR. M. S. MAYOU said he regarded it as belonging to the type of nævus met with in the uveal tract. A few cases had been reported to have occurred in the choroid. He did not know of a vascular one occurring in the iris before.

MR. W. DUKE-ELDER, D. Sc., M.D., F.R.C.S. read a paper giving an account of a research which he had been conducting on

The Factors Controlling the Intra-ocular Pressure.

He said it had been generally accepted until recently that the only controlling mechanism governing the maintenance and variation of the intra-ocular pressure was the blood pressure. His purpose in this paper was to demonstrate that a number of other factors were concerned in such control.

The really fundamental question was as to whether or not the aqueous humor was a secretion. As this fluid was in complete thermo-dynamic equilibrium with the capillary blood and no evidence of secretory activity could be adduced, it seemed logical to regard it as a dialysate. This equilibrium with the capillary blood was a dynamic one, allowing of continuous metabolic interchange, *i.e.*, a thermal and a pressure circulation. The intra-ocular pressure was thus maintained

at the equilibrium level between the pressure of the capillaries on the one hand, and the difference between the osmotic pressure of the capillary plasma and the aqueous humor on the other. Being maintained at this level, it might be varied: Firstly by altering the equilibrium level, *i.e.*, by varying the blood pressure in the capillaries, by changes in the arterial or venous pressure or by changes in the capillary circulation itself. Secondly, by altering the colloid osmotic pressure of the blood or that of the aqueous humor. Another means of variation was by altering the volume pressure of the eye, as by varying the volume of aqueous humor. Or it could be varied by altering the volume pressure of the eye, as by varying the volume of the aqueous, or by varying the volume of the vitreous and lens. Many of these factors seemed, experimentally, to have some effect in determining the variations of pressure met with clinically. Normally, changes in the volume pressure were compensated within the limits of the safety-valve action of the canal of Schlemm. It was especially when the exit in this region was impeded that under clinical conditions, persistent rises of pressure were evident.

Sir John Parsons characterized the work as overwhelming and of very complex character, and expressed his satisfaction that the mechanical interpretation which other workers, including himself, arrived at was not altogether without support in this most recent piece of work. It showed the great advances which had been made of late in the domain of bio-chemistry. No matter how much bio-chemistry and other branches of science progressed, it was of little value unless someone was found capable of applying it properly. Mr. Duke-Elder had shown he possessed all the qualifications for such a research. In an allied sense he also referred with great appreciation to the work on the lens which had been done by Miss Dorothy Adams.

Sir Charles Martin also made congratulatory remarks regarding the paper, the author of which had shown a mastery of some of the most difficult technique imaginable. He would like Mr. Duke-Elder to devote attention to ascertaining the exact physiological conditions which determined the exit of aqueous humor from the eye; he did not think that was such a simple matter as it was generally assumed to be.

Mr Teacher Collins discussed the contribution in some detail. He said he found it difficult to look upon the fluid in the interior of the eye as a stationary fluid, or even as being in a state of equilibrium. A matter which was assumed in the paper was that there was a difference in the degree of permeability of the capillaries in different parts of the body, but the speaker thought that was no more than an assumption. He described some work he did on rabbits in a somewhat similar inquiry a number of years ago, and he suggested to Mr. Duke-Elder that the interchange which went on in the fluids of the eye was chiefly an interchange between the blood vessels of the ciliary body and the aqueous humor. And, if that were so, the interchange which took place was not only a question of permeability of the capillaries, but also that of the cells lining the ciliary body. It was not likely that fluid would pass through two layers of cells without that fluid undergoing some change in the process, perhaps amounting to a suppression of its constitution in some respects. He asked a number of questions.

Mr. Harrison Butler said he thought there was some clinical evidence that though the circulation in the eye was very slow, a circulation existed there. When fluorescine was introduced into the posterior chamber, it was not until about six hours afterwards that it began to appear in the anterior chamber.

Mr. Duke-Elder replied.

REPORT OF THE SECTION OF OPHTHALMOLOGY, NEW YORK ACADEMY OF MEDICINE.

By Dr. THOMAS H. JOHNSON, Secretary.

MEETING OF DECEMBER 19, 1927. DR. BERNARD SAMUELS, CHAIRMAN.

Dr. Arnold Knapp: Report of a case of **Sarcoma of the ciliary body,** with specimens and subsequent history.

The patient was a woman, thirty-two years of age, whose sight in her left eye began to fail in 1921. A diagnosis of choroiditis with glaucoma was made. Two years later her left iris had become a much darker brown than that of the right eye. On account of the glaucoma, a trephining was performed. Six months later a brown mass was recognized just back of the outer column of the iris coloboma, and then the correct diagnosis of sarcoma of the ciliary body was made possible. She was referred to me in January, 1924. In addition to the tumor of the ciliary body, examination of the eye showed that the conjunctiva about the trephine opening was peppered with many pigment dots, with several larger pigment patches, especially two just at the limbus, thus illustrating the dissemination of the cancer cells by the aqueous current. The lens capsule was covered with pigment dots; the iris was transformed into a black membrane. The enormous pigment formation was of particular interest. The eye was enucleated, including the conjunctiva with the pigment deposits about the trephine opening. The pigment spots in the conjunctiva, Professor Ewing regarded as typical metastatic melanomas. The tumor of the ciliary body was the usual pigmented sarcoma, which had broken through into the vitreous, giving rise to diverging pigment strands in the vitreous. The surface of the iris was plastered with pigmented cells, and the region of the

pectinate ligament was filled with a mass of pigment cells, which readily explains the glaucoma. After enucleation, a line of pigment spots remained in the conjunctival scar. These spots were treated with radium, and subsequently there was no increase; they became fainter, and up to the time of the patient's death no local recurrence had taken place in the orbit. Two years later (February, 1926) a sarcomatous growth was removed from the left preauricular region. In December, 1926, pigmented tumors developed in the skin of the body, and the left parotid growth recurred. In February, 1927, the patient died from general sarcomatosis, with tumors in the abdomen and in the skin.

DR. MARTIN COHEN: **A case of chloroma with ocular lesions** (to appear in full).

DISCUSSION: DR. CURTIN spoke of the case of a girl, thirteen years of age, who complained of weakness, deafness and loss of vision for over a period of six weeks. On examination, there was bilateral proptosis—more marked on the right side. Vision R.: L. P.; L.: Fingers at 4'. Pupils, normal. A hard mass, fixed to the bony wall, could be felt in the upper portion of each orbit. The ophthalmoscopic examination of the R.E. showed the media clear, the disc swollen; hemorrhages in front of the disc and elsewhere. Veins markedly dilated and tortuous. Arteries, normal. Similar findings were present in the left eye. Ocular movements were limited, especially upward and inward.

Other findings: Several ulcerating areas in the skin of the upper extremities and in the left axilla; Wass., negative. X-rays of skull showed no evidences of increased intracranial pressure; urine, faint trace of albumin. Blood findings: RBC, 1,410,000, Hgb., 22%. Color index, 73: WBC, 65,000; Polys., 21%; Lymphocytes: 12% small, 44% large; Myelocytes: 23%. Nucleated red cells present.

A diagnosis of chloroma was made, as the blood smear was that of leukemia combined with proptosis and subcutaneous tumors.

Dr. Curtin also gave a review of the usual findings in this disease.

DR. GOLDSTEIN: I saw Dr. Curtin's patient at the Mount Sinai Hospital. She had bi-lateral marked exophthalmos,

due to infiltration of the orbits. Hæmoglobin: 27%; RBC, 1,300,000. Color index 1.03; WBC, 83,200; Blood platelets 80,000; Polynuclear neutrophiles, segmented 9%, band 4%; Myelocytic neutrophiles 22%; Myeloblasts 56%; Lymphocytes 8%; Megaloblasts 1–200, WBC; Oxidase reaction positive. The picture is one of acute myeloblastic leukemia.

Dr. WALDSTEIN: Some eighteen years ago, I saw a case of chloroma of the orbit at the Elschnig Clinic in Prague. It was a boy of about six to eight years of age, very cachectic with marked exophthalmos on both sides; extensive masses behind the eyeballs; beginning (lagophthalmic) ulcers of both corneas; exitus. Findings at autopsy: large greenish masses in both orbits, both suprarenal bodies, the spleen and bone marrow. Diagnosis made intra-vitam (characteristic blood picture).

Dr. SAMUELS recalled having seen only one case.

Dr. SAMUEL P. OAST: **Blue sclerotics—fragilitas syndrome —report of occurrence in mother and infant,** with presentation of patients (published in full).

DISCUSSION: Dr. H. H. TYSON stated that he presented a case of blue sclerotics with fragile bones before this section about fifteen years ago. The child at that time was being treated at the Vanderbilt clinic, and was five years of age and presented the usual signs and gave the history usual in such cases. He said that it was considered an hereditary condition, a maldevelopment of the cornea and sclera, and that it descended by direct transmission through affected individuals only; and also that deafness due to otosclerosis occurred in about 25% of the cases; that, while there was a difference of opinion as to the pathology of this condition by various observers, in the case of Buchanan's when an eye was enucleated on account of an injury and was examined microscopically, he found that the sclerotic was one-third of its normal thickness, and the thickness of the cornea was also greatly reduced. The individual fibers of the sclera were of normal thickness, but were very greatly reduced in number, thus allowing the color of the pigment layer to be seen as a blue color through the thin sclera. This condition has no apparent effect upon the length of the life of the individuals.

Dr. T. H. CURTIN: **Recurrent vitreous hemorrhage and its**

relation to calcium content of the blood. Report of a case and presentation of a patient.

The patient was a female physician, aged thirty-six, who had the usual diseases of childhood; tonsillectomy, 1916; dry pleurisy, broncho-pneumonia 1916–17; infection of left antrum 1919—relieved by extraction of a molar tooth; left frontal sinusitis, 1920. Her eye trouble began in 1913 with an attack of choroiditis, L.E., which cleared in three months. In 1923, there were two attacks of slight blurring of vision, which cleared up quickly. July 5, 1924, pain and slight blurring of vision in L.E., which increased, and on the 15th, vision was only light perception. Vitreous hemorrhage was diagnosed, and a tuberculous etiology was suspected. Vision cleared on August 11, 1924. Wass., neg.; urine, normal; blood picture, normal; blood chemistry, negative.

Physical examination revealed adhesions at lower right base posteriorly, and a few rales at left apex. X-ray findings, negative.

On April 16, 1925, sight became blurred in L. E. for two weeks, and again on January 28th and February 8th. Blood coagulation time normal; tuberculin test (Mantoux), negative. The patient was seen by Dr. Curtin on February 12th—vision $\frac{10}{10}$ in each eye with correction. In the right fundus, there was a small area of exudate above and to the inner side of the disc; in the left, there were floating strings in the vitreous, a small red mass behind the lens; vessels tortuous; a red, oval swelling in the inf. temporal artery, and another in the inf. nasal artery. Blood pressure, $\frac{115}{78}$.

February 27, 1926—calcium content of blood determined: 9.45*mg* per 100*cc* found (normal, 9.50–10.50) so that 15 grains of $CaCl_2$ were administered intravenously at intervals of one week. Also, given 10 grs. ca lactate by mouth, t.i.d.

May 10, 1926—No fresh hemorrhages; no ampullification of vessels. Three slight recurrences of hemorrhages which cleared in a few days. On September 17, 1926, calcium content was 9.85. July 14, 1927, calcium content, 10.65. There have been no further attacks since September, 1926. General health improved; has gained twelve pounds. The fundus shows old choroidal patches due to hemorrhages.

This case is reported (1) because of the rarity of recurrent

vitreous hemorrhages; (2) on account of the apparent relationship between intraocular hemorrhages and a low calcium content in the blood.

Similar low calcium content in the blood was found in two other cases of recurrent vitreous hemorrhages, and in two cases of hemorrhage into the aqueous following iridectomy for glaucoma. In all of these cases, the calcium content was increased by administering calcium chloride and calcium lactate.

DISCUSSION: DR. ERNEST WALDSTEIN: After listening to this paper, I am not sure whether in Dr. Curtin's opinion this case is due to a deficiency in the ca content of the blood or not. I saw this patient in August, 1924, and my diagnosis then was: Juvenile recurrent vitreous hemorrhages due to tuberculous periphlebitis. After the research work done some twenty years ago by Stock and Axenfeld, I find hardly any doubt left as to the correctness of this diagnosis. The fact that Alpine sun treatment and a general tonic régime helped the patient, confirms my view. I certainly do not wish to deny, however, that the ingestion of calcium, by tightening the walls of the blood-vessels and increasing the coagulability of the blood, benefited the patient, and helped in attaining the good result achieved.

DR. J. GEIGER: I had the good fortune to be associated with Dr. Curtin in the management of this, as well as other similar cases. We found the calcium content of the blood below normal, and proceeded to treat the condition first with intravenous injections of calcium chloride, given at weekly intervals. I had some difficulty after the eighth injection, getting a drop outside of the vein, with considerable pain resulting. We then switched to oral administration, giving calcium lactate. The blood calcium increased slowly. The patient then received Alpine lamp treatment, and as has been observed before, the calcium content of the blood increased more noticeably.

It has been fairly well proven that oral administration of calcium lactate is equally as effectual as intravenous, the optimum dose being five grams daily. It is important to bear in mind that the maximum rise in blood calcium occurs between the first and fourth hours after ingestion, and is maintained for about eight to twelve hours.

Dr. H. MINSKY presented a patient, aged eighteen, with extensive **Detachment of the retina,** with complete tear at the ora serrata above, exposing the choroidal circulation. The detached retina hung down covering the lower half of the fundus.

DR. SCHOENBERG read a paper on **Experiences with ephedrine,** which is published in this number.

Dr. Schoenberg demonstrated three **New attachments to the slit lamp.** *The first attachment* consists of a series of plano lenses containing one or two prisms, arranged in such a position as to produce two or more light bands on the cornea and a corresponding number of optic sections through the optic media. The prism-containing lens is placed in a holder, fastened in front to the roof of the focussing lens. It can be moved sideways, by the aid of a rack and pinion arrangement. The advantages of throwing several optic sections through the media of the eye are several—first, the fact that we can examine a larger area of the cornea at the same time, and compare two adjoining areas at one glance; second, a better appreciation of depth and of irregularities of thickness of the cornea; third, an increased possibility of following the direction and course of blood vessels, nerves and linear changes; fourth, an easier examination of the reflex zones of the endothelial layer of the cornea and of the posterior layers, and of the capsule of the lens.

The second attachment. The use of the Maddox multiple rod. If we place the Maddox rod at a distance of 15*cm* in front of the slit, in a special holder, fastened to the arm of the slit lamp, we obtain a row of light bands on the cornea. Each of these light bands consists of three parts: two larger ones at the extremities, and a very narrow portion in the middle. Corresponding to this row of light bands, there are as many optic sections passing through the lens in to the vitreous. The main importance of this form of optic sections is for the examination of the vitreous.

The third attachment. A diaphragm with a number of slits of various shapes and sizes, placed in the holder at 15*cm* in front of the slit. The holder has a rack and pinion arrangement so that any desired slit can be moved in the path of the rays of light during their course to the focussing lens. The slits of the

new diaphragm are of such a shape as to cut out certain rays of light and permit other rays to pass. The result is that light bands of angular or semicircular shapes are formed on the cornea. To these light bands, optic sections with planes inclined on each other are seen going through the media of the eye. These are of advantage in examining changes in the lens and vitreous.

Historical perspectives in ophthalmology [1] By DR. ARNOLD C. KLEBS, Nyon, Switzerland.

A very notable increase of interest in the history of Medicine has taken place in the United States during the last few years, stimulated by men of broad culture such as the late William Osler, Welsh, Cushing, Streeter and especially by the admirable systematic discussion of the subject in the textbook of Garrison. Efforts are made in various quarters towards making the cultivation of historical research a vital part of medical training; the fact that a historical habit of thought adds to the equipment of both practitioners and research workers is becoming widely recognized. The mere revelation of dates, of historical events, of the collection of old books and curios are helpful in this direction, the study of medical portraiture, of biography, of the intricacies of bibliography can become pursuits of absorbing interest well suited to dispell the tedium of professional routine. For critical analysis of historical evolution and for the philosophical appreciation of the revelation of the various component factors to each other within this evolution a deeper study of original sources becomes necessary and it is most gratifying to note that in various parts of this country preparation also for such research work is being made.

The history of ophthalmology presents a well-tilled ground. Hirschberg and his school have laid its solid scholarly foundations, and in this country notably Drs. Harry Friedenwald and Casey Wood have made excellent contributions. The writer having come in contact with ophthalmology but once in his life when he prepared his inaugural thesis some thirty years ago, is unable to give more than superficial impressions gathered in his general historical studies.

---

[1] Read at February meeting, 1928.

The large part that optics occupies in ophthalmological science and practice bestows upon this branch of medicine the right to truly scientific consideration such as no other possesses. If mathematic formulation is the criterion for a true science, as Descartes, Kant and Bertrand Russell held, then among all medical branches, and possibly in biology, ophthalmology holds first rank. But there is other basic knowledge needed by the ophthalmologist, knowledge of quantities that are not measurable or ponderable. It is that knowledge that comes through careful training of the cerebral and retinal eye in conjunction with that of the hand. It is the knowledge of the intelligent craftsman such as Hippocrates described so well in his famous expression o "tribe meta logoo." Philosophy evolving into science by the road of mathematics, craftsmanship into art, seem to have thrived side by side during long ages without distinct influence of the one on the other. The former reached towering heights in ancient Greece, the stream of the latter seems to have flown steadily from the orient to the occident, along the route India en–hellenistic Alexandria, North Africa, Sicily and Spain. Wherever the two streams met, as in Alexandria, in Byzantine realms, under Arab caliphs, during the so-called Renaissance in the middle-ages and way into our own times, practice could make notable strides ahead; wherever they flowed separately other cultural and political endeavors would prevail with the result of apparent medical stagnation.

An innate contempt, which the man of the head seems to hold for the man of the hand, has been in all times an obstacle to the harmonious evolution of the medical art. Ophthalmology has bridged the gulf more successfully than any other specialistic branch. In intimate contact with pure science, combining surgery with medicine, its adepts, in a limited field, have united in themselves in their activities the two historical streams, and thus pointed the way for an improved educational preparation of the larger field.

Following Dr. Klebs' paper Dr. Lambert made a motion that avote of thanks be tendered the doctor for the most interesting and scholarly paper. The motion was adopted unanimously.

ABSTRACTS.

Vereinfachung und Verbesserung der West-Polyak'schen Endonasalen Tränensackoperation (A Simplification and Improvement upon the West-Polyak Endonasal Lacrimal Sac Operation). With twelve illustrations. By Dr. Karl Kofler and Dr. Josef Urbanek. From the I University Eye Clinic in Vienna. Publisher: S. Karger, Berlin, 1927.

In a monograph of sixty-three pages including thirty clinical reports of cases, the authors argue for their transseptal method through the opposite side of the nose for intranasal lacrimal sac operations, claiming that the original intranasal operation, through the same side of the nose as the diseased tear sac, presents serious difficulties.

As a preliminary step in the transseptal procedure, an incision is made through the nasal septum from the side of the nose opposite to the diseased tear sac. The lacrimal sac operation is now performed through this septal incision, working always from the side of the nose opposite the tear sac, which is to be opened, that is, the left sac is opened through the right nostril and vice versa.

Through the septal incision a flap of nasal mucous membrane is now turned aside thus laying bare the bony wall of the lacrimal fossa. The position of the sac is located with a hooked instrument with which the operator feels around the exposed bony surface until the hooked end of the instrument enters the suture between the frontal process of the superior maxilla and the lacrimal bone. Having thus located the frontal-lacrimal suture the operator knows where to apply his chisel to remove the nasal wall of the lacrimal fossa thus exposing the sac on the lateral wall of the nose. The nasal wall of the sac is now removed leaving the external wall with the nasal outlet

of the canaliculi intact. The flap of nasal mucous membrane which originally covered the lacrimal fossa, and which at the beginning of the operation was turned aside, is now replaced, the incision through the nasal septum is closed with a stick and the nose is tampooned on both sides. In cases in which the septal cartilage has been removed at a previous operation for deviated septum a permanent perforation results, otherwise not.

The temporary removal of a flap of nasal mucous membrane from the lacrimal fossa, the opening of the fossa thus exposing the sac, and the removal of the inner sac wall, are all technical steps of the operation, which the reviewer described in 1913. *The only new idea which the authors have to present is their diagonal approach to the lacrimal region from the opposite side of the nose working through an incision in the septum.* Is this new suggestion of advantage or not? The reviewer is convinced he can answer the question in a negative sense.

The authors claim that their transseptal method of approach possesses a great advantage in permitting the operator to see the lacrimal region more "en face" and less "en profil," and that the instruments can be better applied diagonally through the septum than can be done in the straight entero-posterior direction through the same side of the nose.

In the course of the last fifteen years in three cases with large luetic perforations of the nasal septum combined with extreme narrowness and adhesions of the same side of the nose as the diseased tear sac, the reviewer has done the intranasal tear sac operation by the transseptal route through the septal perforations, and although the existing perforations offered a much better exposure of the lacrimal region than could be obtained through an incision in an intact septum, he finds the method very unsatisfactory and for the following reasons.

In most cases there exists on the lateral wall of the nose a bony ridge, for which Kopsch has suggested to the reviewer the name "Torus lacrimalis." This bony projection is the landmark indicating the location of the lacrimal fossa, the spot where the operator should apply his chisel to expose the tear sac. This anatomical landmark can *only* be seen properly "en profil," that is, directly through the same side of the

nose as the diseased lacrimal sac. With this land-mark as a guide the hooked instrument used by the authors for feeling around to locate the fronto-lacrimal suture becomes entirely superfluous.

Another and more serious objection to the transseptal method is that in applying chisels diagonally to the lacrimal region, working from the opposite side of the nose, one is chiseling more directly towards the orbit than is the case with the chisel applied through the same side of the nose, and there is the danger of opening this cavity. To avoid this accident one must work much more slowly and carefully. By the direct method through the same side of the nose this danger is practically excluded. The reviewer can well understand the author's fear of operating a phlegmon of the tear sac by their transseptal method. Should the orbit be opened by this indirect diagonal approach an orbital phlegmon might result. On the other hand, however, with the direct operation done by one, who has mastered the technique, a puncture of the orbit is practically impossible, and the reviewer has often operated upon phlegmons of the sac by the direct intranasal route in order to allow the patient to return home in the shortest possible time.

Then too, after the tear sac has been freely exposed on the lateral wall of the nose it is much easier, and also much more accurate to pull the sac towards the nasal cavity, and with a straight scapel remove its inner wall, or remove the sac in toto, working "en profil" through the same side of the nose, than to attack the sac diagonally from the opposite side. A surgeon amputating a leg naturally stands at the side of, and not in front of the patient.

It is also sometimes of advantage to fracture the attachment of the middle turbinate and push this body towards the septum in order to get a better exposure of the field of operation. This maneuver also is much more easily done directly through the same side of the nose, than by the diagonal approach from the other side.

Another disadvantage of the transseptal route is that at the close of the operation ***both*** sides of the nose must be packed in ***every*** case. With the direct operation in cases where the septum is not resected, the operated side of the nose ***only*** is

tampooned, and there is also much less post-operative hemorrhage than occurs after the incision through the septum in the transseptal procedure. One side of the nose is free for respiration, which with less bleeding, means much for the comfort and safety of many cases, particularly elderly patients.

The authors in their operation remove the internal sac wall only, and are opposed to the intranasal total extirpation fearing injury of the nasal outlet of the canaliculi, which might later result in closure of the outlet. The reviewer can quiet their fears on this point, for after removing intranasally several hundred tear sacs in toto he can state that the artificial opening into the nose has no more tendency to close after the intranasal total extirpation than after the simple removal of the nasal wall of the sac. And moreover the complete removal has distinct advantages. With half of the diseased sac left in the nose, should a closure of the bony window occur, a suppurative condition of the remaining part of the sac can arise, giving the clinical picture of a suppurative dacryocystitis with the danger of an ulcus serpens. Such a suppurative condition is impossible after the intranasal total extirpation. Following the total extirpation, closure of the artificial opening can cause nothing worse than a disagreeable epiphora, and the patient can choose his time in returning to the operator to have the obstruction removed and the tearing cured. Intranasal total extirpation, properly done, not only restores the physiologic drainage, but also removes all future possibility of suppuration of tear sac origin, and is by all means the operation of preference in cases of dacryocystitis, and the operation of necessity in cases of ulcus serpens. The tear sac is an unnecessary organ, and when diseased, it is better removed completely than only partially. For a number of years now the reviewer has done the total extirpation in practically all cases. Complete removal of the sac intranasally is, however, technically more difficult.

The authors claim that cases of epiphora following the external extirpation of the sac have in the past been incurable until their transseptal method enabled them to establish nasal drainage in such cases. They also would have one believe that in their single case of ulcus serpens, as well as in cases of cataract combined with dacryocystitis their transseptal oper-

ation inaugurated a new treatment in these conditions. The authors have apparently overlooked the fact that the reviewer as long ago as 1913 reported his first case of cataract in which Prof. Silex had successfully done the extraction after an associated dacryocystitis had been cured by the intranasal sac operation. Also in 1916 the reviewer reported three cases of serpigenous ulcer which rapidly healed following the intranasal extirpation of the tear sac. And in a publication of 1918 the reviewer especially called the attention of ophthalmologists to the results that can be obtained in cases of epiphora following external operations, and mentioned a whole series of cases, many of which had undergone *several* external operations before being cured by the intranasal procedure. By a "cure" is meant a positive color test after healing. Argyrol dropped into the eye must appear in the nose.

Also the monograph tells us that if the canaliculi are patent (a solution injected into one canaliculus, returns through the other) after an external operation, then the intranasal procedure will cure the epiphora. This statement is only true in cases where the canaliculi still function, and on this point the authors are silent. All canaliculi that are patent do not by any means function properly, that is, take up the tears from the conjunctival sac. If the tears do not enter the punctum they cannot drain into the nose even if we make an intranasal artificial opening. The reviewer published in 1918 a functional test for the canaliculi which when positive gives an excellent prognosis for a dry eye after the intranasal operation. Should the "canaliculus test" be negative, that is, should the canaliculi not function properly, the prognosis is very, very uncertain. In some cases one can modify the usual operation, restore the function of the canaliculi and cure the epiphora.

The monograph closes by mentioning the external ophthalmologic procedures for establishing drainage into the nose in cases of dacryostenosis, and calling attention to some of their disadvantages, for example, deformity, erysipelas, keloid formation at the sight of operation, severe hemorrhage, failure of wound to heal primarily. The authors, however, fail to point out the *most important* objection to *all* external operations on the lacrimal apparatus, which consist in the skin incision and the division of the internal ligament of the eye.

This separation of the tissues in a large percentage of the cases so alters the anatomical relations of the parts that after healing has taken place the physiologic function of the canaliculi is destroyed and epiphora results, even though the artificial opening may remain patent.

The reviewer considers that the transseptal method possesses an element of danger to the orbit, is less exact, and more time consuming than the direct intranasal procedure, and is to be considered *only* in cases with large existing septal perforations combined with unusual stenosis of the same side of the nose, or in traumatic cases where the side of the nose containing the diseased tear sac is occluded. And also in many of these cases it would be much better to restore the patency of the nose, doing the tear sac operation by the direct method at the same sitting.

J. M. West.

VI.—**Nasal Neurology, Headaches and Eye Disorders,** by GREENFIELD SLUDER. St. Louis. With 167 illustrations including 2 colored plates. P. 428. Published by The C. N. Mosby Co., St. Louis, 1927. Price $11.50.

In 1918 the author wrote a monograph "Concerning Some Headaches and Eye Disorders of Nasal Origin" which was reviewed in these ARCHIVES in 1919, p. 208, and the great value of this subject to oculists was emphasized. The author convinced of the importance of the neurological side of rhinology has enlarged upon his original presentation and publishes it now under this new heading.

Unquestionably this is a remarkable treatise. How much of it will stand the test of time remains to be seen. I do not feel competent to pass on the pathology, neurology or ophthalmological portions of it. So much depends on verification of the pathological findings accredited to hyperplastic changes, that unless these can be confirmed by competent pathologists, the very ground work of his views is untenable.

It does not seem to me that this explanation of eye symptoms due to vacuum frontal is rational. I cannot believe that the orbital surface of the frontal in the neighborhood of the pulley of the trochlearis is so displaced in a frontal sinus vacuum (?) if such ever occurs, as to produce the eye symptoms as described by the author. The vacuum headache phase of rhinology was at its height about 1892–5, and gradually nearly disappeared since. If vacuum frontal, why not vacuum ethnoid and sphenoid, and, to a less degree, even maxillary?

Sluder's description of the spheno-palatine ganglion, its anatomical position and the means of approaching it intranasally, are very clear, and the points are beautifully and very fully illustrated in the text. I have never had occasion to

inject the ganglion though frequently to cocainize it. My results have not been anywhere nearly as satisfactory as Sluder's. It is but fair to say that the cases of headache and neuralgia radiating to shoulder, arm, etc., have not been referred to us so that I can not pass on that class of cases.

Sluder's description of his method of operating on the ethmoid and sphenoid intranasally is excellent, and when done by one who is conversant with the anatomy of the parts, has a minimum of danger. We do not agree with him, however, that orbital abscess secondary to frontal, ethmoid and sphenoid suppuration is best operated upon by the intranasal route.

The chapter on Nasal Neurology is a most interesting one, but one which requires much more knowledge of the nervous system than I possess, to fully comprehend, let alone discuss.

The case histories are interesting, yet the results in many leave me in doubt as to whether Sluder were on the right track.

C. G. COAKLEY.

VII.—**Die Mikroskopie des lebenden Auges** (Microscopy of the Living Eye. Slit-Lamp Atlas), by DR. A. MEESMANN. First Assistant Charité Eye Clinic, Berlin. Published by Urban and Schwarzenberg, Berlin, 1927, 169 pages with 35 text figures, 210 colored engravings, and 64 pages of explanatory notes. Price 55 Marks.

Meesmann has contributed a valuable addition to the still very meagre number of Manuals on the Subject of Ophthalmo-Biomicroscopy. His book consists of two parts. The first part gives a general outline of the subject and is divided in a number of chapters. The description of the apparatus and of the physical principles involved, takes up about twenty-two pages, while the general principles of the technic and methods of examination are treated in fourteen pages. The author, who has very diligently used this apparatus for fifteen years, seems to be quite satisfied with the Zeiss model and offers no suggestions—except one—regarding any improvements or modifications of its shortcomings. He adopted Kobi's idea of placing a +11. cylinder in front of the slit, thereby he obtains 2 foci of illumination, one corresponding to the focussing lens and the other nearer, corresponding to the cylinder. Among

others, there is one distinct advantage to the addition of this cylinder and this is that the illumination of the optic section through the media of the eye is greatly intensified.

Being very familiar with the various technical details in the use of the principal methods of examination, the author overlooked to place himself in the position of the beginner, who may wish to acquire a working knowledge of these methods from a careful perusal of the book and atlas. Although the chapters on technic and methods of examination might have gone a little more into details for the benefit of the less expert confrères, the more advanced readers will be satisfied to find a number of valuable points both for routine examination and research work. The chapters, following the first two, deal with the more typical clinical findings revealed by slit-lamp microscopy. Rare conditions are mentioned only when a technical point or some important question related to a specific problem are under consideration.

Numerous personal observations hitherto unpublished are to be frequently found scattered all throughout the textbook and atlas. A very good feature is the author's clear-cut stand regarding certain mooted questions on which the pioneer workers (Vogt and Koeppe) have disagreed. However the author advises his readers to consult both, Vogt's and Koeppe's books in conjunction with his own, whenever there is a question of interpretation of a doubtful case.

The chapter on the conjunctiva is covered in two pages. Among the ten engraved pictures illustrating conjunctival conditions the one on plasmom of the conjunctiva and on melanosarcoma at the limbus are particularly interesting. The cornea is treated in seventeen pages of text and seventeen plates with sixty-three illustrations. Those on dystrophia endothelialis, copper and silver dust infiltrations of the cornea, keratitis gummosa, keratitis tuberculosa, keratitis uratica deserve special mention.

The anterior chamber and iris occupy nineteen pages and nineteen pictures. The various types of remnants of pupillary membrane, a cyst of the iris stroma, nodular exudates of the pupillary margin are interesting.

The normal lens, its peculiarities at various ages, its congenital anomalies and its pathological changes are systematically

and very painstakingly studied and illustrated in thirty-one pages and ninety-two pictures. The various types of polar cataracts, traumatic separation of the zonular lamella, siderosis lentis, electric cataract, cataracta diabetica (?) are only a few of the many illustrations of unusual interest.

Six pages of text and fourteen illustrations with their explanatory notes cover the subject of normal and pathological vitreous. Our methods of illumination are still in their infancy and of all the tissues of the eyes, the vitreous with its extremely poor relucency, is the best proof of the greatness of our ignorance in matters regarding illumination. Let us hope that a future edition of Meesmann's book will tell us a little more about this very interesting tissue.

The angle of the anterior chamber has not been very fairly treated. Apparently the author had no opportunity to use Troncoso's Gonioscope.

Finally the chapter on fundus oculi as seen with the aid of the slit-lamp microscope and contact glass is one of the best and most stimulating chapters of the book. A case of papilloedema and one of sarcoma of the chorioid, covered by a detached retina, which could not be diagnosed by the ordinary methods (not even with the Gullstrand ophthalmoscope) and which could clearly be recognized by the Koeppe method are among the most interesting and useful contributions of the book.

We shall not omit to mention that the book contains an up-to-date (1926) bibliography and a good index.

The text is lucid, the subject matter and illustrations, systematically arranged, serve as good guide to one trying to clear up a point or studying a case. The artistic side of the illustrations lacks the finish one would desire to see in a work of this sort. The colors lack the natural softness,—and some pictures appear more like a schematic drawing than an artistic product. But after all, perfection is not a human attribute.

The reviewer regrets to miss in the atlas some of Knüssel's illustrations on intravital staining of the nerve fibers of the cornea and conjunctiva and of the lymphatic of the conjunctiva; also Graves' findings obtained by his refinements of technic are not sufficiently emphasized. An excellent feature is the explanatory notes on the page opposite each illustration

and the numbers cross-indexing the text with the illustrations are a distinct advantage. Studying the pages of this book and atlas one has the feeling of taking an imaginary journey through strange and wonderful lands, led by the hand of an experienced guide and listening to tales beautiful and true. Meesmann has given us a book which is a good piece of work: it is honest and stimulating.

MARK J. SCHOENBERG.

VIII.—**Trattato di Oftalmojatria,** by PROFESSOR A. BIETTI.

Before me lies the **Trattato di Oftalmojatria** in three volumes, written by Professor A. Bietti, formerly director of the Ophthalmological Clinic of Pavia and now the head of the clinic of the University of Bologna. These recent and very complete volumes are the result of long and lasting work on the part of an uncommonly scientific author who has made full use of vast clinical experiences.

The masterful work of Professor Bietti is clear and precise in every detail. It is intended to emancipate itself from non-Italian ophthalmic influences in the line of textbooks. The student, the general practitioner, and whoever works in the field of ophthalmology will no longer be obliged to use foreign textbooks but will find, so it is promised by the editors, all that is most modern in this field of medicine in Professor Bietti's handbook. It will be read by all who desire to acquaint themselves with the teachings of ophthalmology, particularly in its pathologicoanatomical aspects. These follow the clinical chapters in the treatise and are, in a measure, deduced from them.

The first volume introduces the medical student into the fundamental principles of anatomy and physiology in a clear and rather elementary way, and soon leads on to ocular therapeutics. The author enters into this important chapter with some remarks on pre- and post-operative measures, protective glasses, artificial light and regular medical therapeutics; follow the local non-medicinal measures,—paracentesis, subconjunctival injections, leeches, thermo-, electro-, photo-, Roentgen-, and radium therapy. It would be difficult to find ten pages of print with more practical remarks than are

contained in these and the following ones on general therapeutics.

The difficulty of reporting on Professor Bietti's work increases as one enters into the chapters on the conjunctiva and the cornea:—nearly three hundred printed pages, profusely and instructively illustrated with useful interpretations of old and young research men (last but not least Bietti himself). It almost contains a history of their pathology and therapeutics. Notwithstanding their encyclopedic character, the elementary way of representing the matter, the clearness and liveliness of diction allows clinical pictures on each page almost to rise before the mental eye of the reader, be he student, practitioner or teacher. Take, for instance, the treatment of trachoma by means of the roller forceps of Knapp or Kuhnt, or Lindner's epochal work. Take the chapter on treatment of conjunctivitis blennorrhagica. One must have realized the sometime agony which the treatment of this affection caused the attendant medico, be he old or young. Nor are the simplest affections,—pterygia, traumatic lesions, etc.,—treated lightly. The reviewer,—old, retired, but still endowed with untiring interest in ophthalmology—confesses to have enjoyed Bietti's conjunctival clinical talk fully. The illustrations are as good as the text.

The reviewer passes on to the end of the first volume, one hundred pages of print with many illustrations, and renders thanks for the recommendation of the use of leeches. Galvanocautery comes in but for scant praise. Finsen therapy is lauded. It is regrettable that the author has never used a simple but efficient kind of actual cautery,—the end of a rounded strabismus hook heated to cherry, rose-color in the flame of an ordinary alcohol lamp, as recommended by Martinache.

The second volume of the treatise deals with diseases of the sclera and uveal tract. Follow diseases of the retina. The reviewer remembers Herschberg's advice to exert fairly severe thumb pressure on the embolic bulbus for about thirty seconds. The pressure is then released and the current of blood gushing forth with renewed vigor is supposed to reopen retinal circulation. Knapp's ARCHIVES many years ago published such an experience. Bietti does not mention it. If there were any-

thing left to be wished for to complete the excellence of the work, it is colored backgrounds,—for the benefit of the student and young practitioner.

The second half of the second volume presents a fairly exhaustive treatise on crystalline affections, referring at length to Hess's masterly work on this topic. Follow glaucoma and diseases of the motor apparatus,—both chapters brought up to most recent research and well illustrated. Orbital affections are well put forward. Follow the relationship between ocular affections and internal diseases, dioptrics and anomalies of refraction.

The surgery of the eye treated in a little over one hundred pages brings to the reader well-known matter in a clear way with instructive pictures. It does not pretend,—and cannot give,—what the exhaustive treatises of the ophthalmological surgeons do.

A few words to sum up:—Bietti's work stands in style, in diction and in contents in the very first line of modern text-books of ophthalmology.[1] Its very "embarras de richesse" might possibly suggest a division of the vast material,—a division for students only and another for practitioners and operators. In that case, illustrations in color would prove very useful, especially in anatomic pathological parts. The reviewer considers Bietti's work easily "primus inter pares" in ophthalmic literature.

ADOLPH BARKAN.

IX.—**The Extra-Ocular Muscles,** by DR. LUTHER C. PETER, Philadelphia. 294 pages with 98 engravings and five colored plates. Publishers Lea and Febiger, Philadelphia. Price $4.00. 1927.

Many volumes have been written about the extra ocular muscles and several illustrious ophthalmologists have devoted time and study to this important phase of their specialty; among the Americans who have added much to our knowledge on this subject are Duane, Howe, Stevens and Savage while Worth and Landolt have been the chief European contributors. The works of these men are well known and their

[1] He has constantly and strongly been reminded of Ernst Fuchs' work, which still remains our ophthalmic classic.

names are inseparably linked with ophthalmic myology and now Doctor Peter's clear, concise and practical book assures him of a place in this list. This volume which is dedicated to his students, past and present, is an elaboration of a course of lectures he has so successfully given at the Graduate School of Medicine in the University of Pennsylvania. He incorporates in it the teachings of Worth and Landolt placing great emphasis on Worth's fusion theory but is rather scant in his references to the admirable work of Duane.

This book is divided into five parts viz, anatomy and physiology; heterophoria; heterotropia or concomitant squint; paralytic squint and talantropia (nystagmus) and each of these subdivisions is considered separately and in more or less detail.

The author acknowledges his indebtedness to Whitnall's Anatomy of the Human Orbit for many of the descriptions and illustrations of the anatomy and by clever arrangement of this subject matter makes this one of the best chapters in the book. The ophthalmotrope, is an ingenious instrument devised by the author and Doctor Edwin B. Miller, for showing the action of the various muscles and is particularly useful for demonstration purposes before large groups.

The various tests for heterophoria are discussed at some length with the conclusion that the Maddox rod is the most practical for every day use. Proper emphasis is placed on the necessity for the routine determination of the muscle balance at the near range as well as at infinity. In the treatment of exophoria he is most enthusiastic over the results of prismatic exercises and aptly says that failure follows faulty technic and lack of attention to the minute details. He condemns tenotomy of the external rectus a procedure which the reviewer has found extremely useful in those cases of exophoria due to a divergence excess.

Since the state of the fusion faculty is accepted as the important etiological factor in concomitant strabismus this chapter is devoted almost entirely to an elaboration of Worth's ideas. It does however contain some original work by the author on the character of the scotoma found in amblyopia exanopsia, which is intensely interesting and seemingly justifies his conclusion that the scotoma is the result and not the cause of the deviation. His results on the treatment of

amblyopia ex anopsia are most encouraging and should stimulate ophthalmologists to make a more determined effort to cure this condition. Early operation is very correctly advocated because macular vision is less likely to suffer and the fusion faculty is more responsive to stereoscopic training after operation at the early age of six years. Attention is also called to the mental distress occasioned by the deformity and its bad effect on the mental and physical development of the child as another important reason for its removal at an early age.

Paralytic squint is fully discussed, the etiology being particularly well given and special attention is placed on diagnosis, yet one finds no mention of the use of Duane's modification of the Bjerrum screen. Is it not the most accurate method of determining the diplopia field?

Although the reviewer is not in entire accord with all the views expressed in this volume he believes it is a valuable addition to our literature on ocular movements, and recommends it to the ophthalmologist for his careful study. It is so free from mathematical problems, of such a clinical character and so clearly expressed that any one interested in the ocular movements will find it very interesting and instructive reading.

JOHN H. DUNNINGTON.

NOTICE.

Oxford Ophthalmological Congress.

The sixteenth annual meeting of the Oxford Ophthalmological Congress will be held on July 5th, 6th and 7th, under the presidency of Mr. Philip H. Adams. The members will assemble at Keble College (where accommodation has again been offered) on the evening of Wednesday, July 4th, and on the following morning a symposium will take place on "The ultra-violet ray," introduced by Professor Leonard Hill and Mr. W. S. Duke-Elder. The Doyne Memorial Lecture will be delivered on the morning of July 6th by Professor Arthur Thomson, his subject being "Observations on the eyes of birds." One afternoon will be devoted to demonstrations in the Scientific and Commercial Museums. The annual dinner of the Congress will be held on July 5th in the Hall of Keble College. The full program will be issued in June. Mr. Bernard Cridland (Salisbury House, Wolverhampton) is again acting as honorary secretary.